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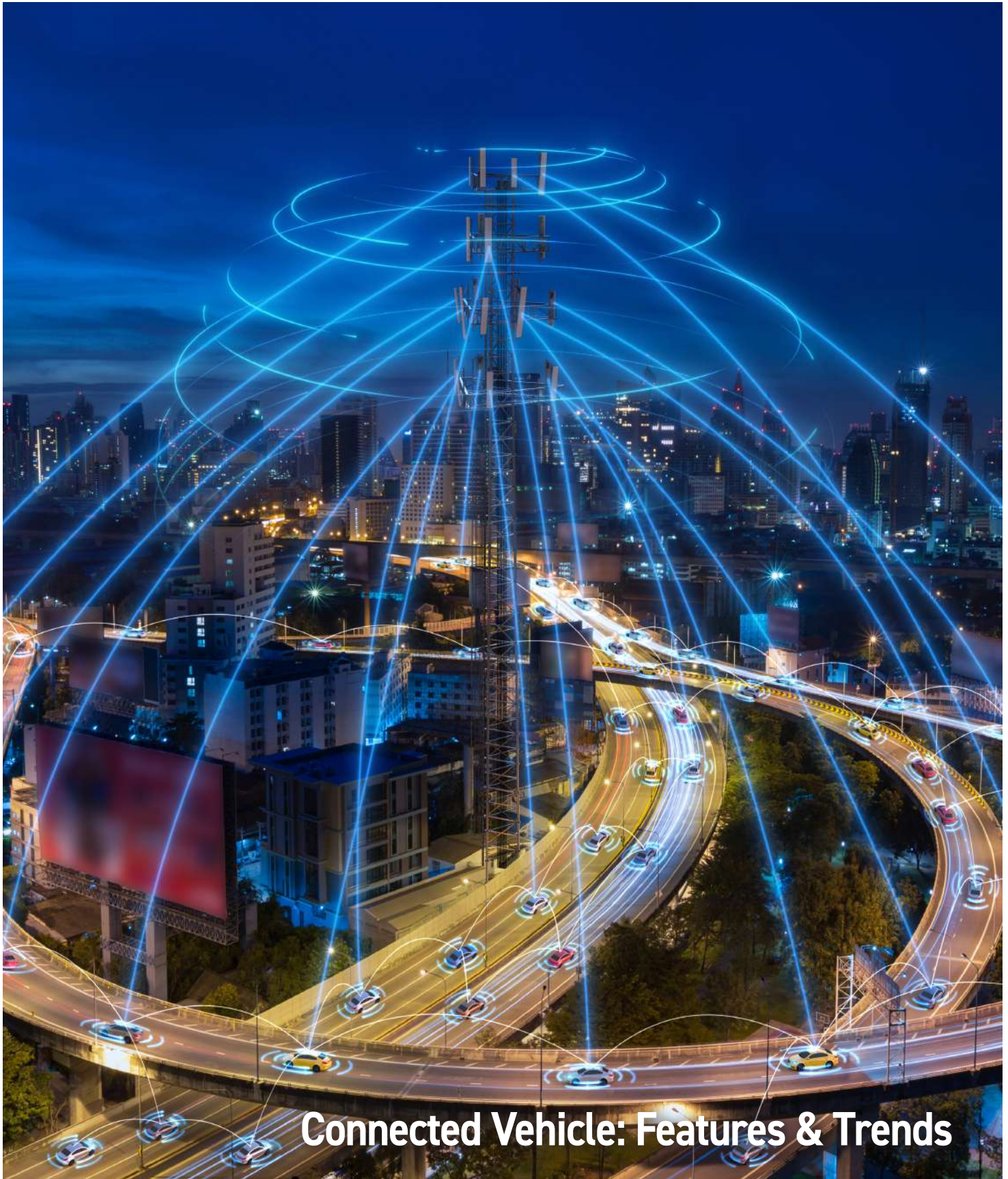
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Accelerated Automotive Product Development using DevOps

✎ DR. ARUNKUMAR M. SAMPATH
Tata Consultancy Services

Introduction

The automotive industry, which is more than 100 years old, has been going through significant disruption in multiple areas including technological advancements, accelerated product development cycles, green mobility initiatives, evolution of Internet of Vehicles (IoV), Edge Computing, Drive-by-Wire (XBW), and Over the Air (OTA) Software updates. As many of the vehicles have been increasingly adopting more and more advanced electronics and related Hardware and Software, in contrast to the earlier dominant mechanical systems, new features with increased complexity of development and launch are finding their place in the vehicles. Of late, the differentiators among different brands and vehicle variants on performance and features are noticeably defined by Software. Though software plays a very important role in enhancing capabilities in vehicles such as latest innovations in semi-autonomous driving, Advanced Driver Assistance Systems (ADAS) etc., it is also creating development challenges for automotive

players with enormous costs of integration and upgradation of features, faster turn-around time, and bullet proof reliability and performance expected from customers, besides data privacy and cybersecurity. In the recent past, automotive OEMs had to incur expensive recalls to fix SW vulnerabilities due to hacking or to address issues such as non-deployment of airbags during crash situations.

As can be seen from Figure 1 (Ref [1]), the software complexity has been increasing by many multiples (top solid curve) while development productivity and innovation in auto industry will barely increase by 2030 (bottom solid curve) with productivity of technology leaders, though outpacing the automotive players, still cannot catch up (middle dotted curve), indicating widening gap between SW complexity and productivity. Additionally, with rapidly evolving technology and the market dynamics demanding faster turnaround time, the non-availability of specific skilled workforce and/or difficulties in training or redeployment of resources in Automotive

OEMs and Tier 1,2 suppliers will further compound the problem of addressing the widening gap between SW complexity and productivity.

Frequently, the development of automotive SW modules occurs in silos with little cross-pollination among teams within the OEMs and with other modules purchased from or co-developed with strategic suppliers, essentially stitching together discrete SW modules, which the OEMs try to convert into a proprietary SW platform. As new features on a next generation vehicle may call for new SW development or enhancement of existing SW on multiple domains comprising hundreds of functional components in the vehicle and on cloud (Figure 2, Ref [1]), OEMs typically interact with multiple suppliers and SW vendors to build the required capabilities, ending up with a piecemeal approach (operating systems, SW architectures, development languages etc.) as no single SW platform can meet all the needs. Though automotive OEMs significantly reduced the SW development costs and timelines by tapping into other industries such as a) Aerospace and Manufacturing automation for ADAS software, b) smartphone industry for infotainment and automotive variants of mobile operating systems, and c) real-time operating systems (RTOS) from embedded software vendors and semiconductor suppliers, development of automotive features increasingly relies on seamless integration among multiple vehicle subsystems with urgent need for end-to-end platform to connect everything together. The accelerated SW development, inter-connectivity of feature development on multiple vehicle subsystems, daunting task of SW interface control and integration,
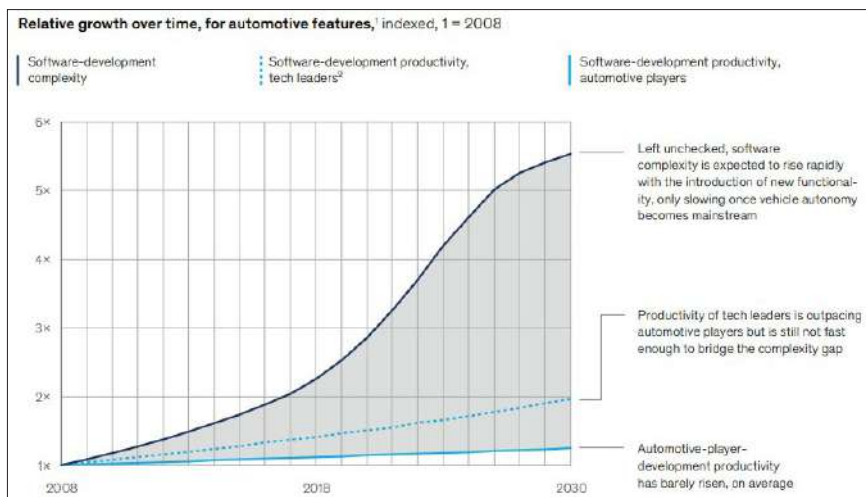

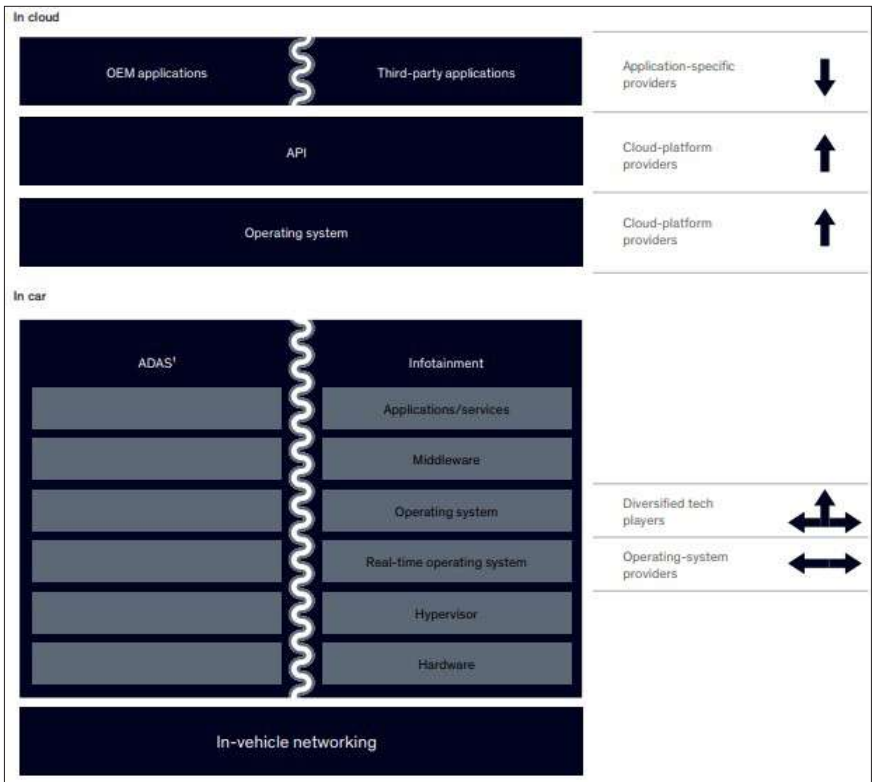**Figure 1:** Software Increasing Complexity (Ref [1])

Figure 2: Software Vendor Diversification & Potential Integration (Ref [1])

and the urgent need for collaborative effort among OEMs, Tier 1,2 suppliers, and SW vendors for an end-to-end SW platform development, is a clarion call to reorganize in terms of the software development process called DevOps (Figure 3, Ref [2]).

The Role of DevOps in Accelerating SW Deployment

Development and Operations, DevOps for short, includes collaboration, continuous integration, continuous deployment, and continuous feedback, with the ultimate goal to increase the cycle speed between feedback from end-user to an updated software. The objective of DevOps is to accelerate the SW development process and reduce the time to market by breaking down "silos" within an organization and utilizing cross-functional teams (CFT) more effectively. The DevOps practice includes a full-fledged product development cycle, applicable in multiple industries including Automotive.

As can be seen from Figure 3, Ref [2], DevOps pipeline consists of 8 phases.
In the **Plan** stage, requirements from the customers are captured and feedback/lessons learned from different stakeholders are incorporated to build a product

roadmap even before the developers start writing code.

During **Coding** phase, the SW development team usually has the standard toolkit and set of plugins to help write consistent code-styling avoiding common security flaws, aiding collaboration by providing consistency, and preventing failed builds/SW tests down the pipeline.

After the coding is done, in the **Build** phase, the SW developer typically submits a pull request to merge their new code

with the shared code repository, which would be reviewed manually by another developer and the pull-request approved if there are no issues. The pull request triggers an automated process which builds the codebase and runs a series of end-to-end, integration and unit tests to identify any regressions. If any of the tests fail or if the build fails, the pull-request fails, and the developer is notified to resolve the issue. By continuously checking code changes into a shared repository and running builds and tests, any integration issues that arise are minimized and SW bugs are identified early in the development lifecycle during Build phase.

In the **Test** phase, after Build succeeds, the SW is automatically deployed to a staging environment such as an existing hosting service or a new environment (Infrastructure-as-Code) provisioned in the SW deployment process for deeper, out-of-band testing comprising a series of manual and automated tests. While the manual testing might be similar to how an end user might test (User Acceptance Test), the Automated tests might run security scanning against the application, check for changes to the infrastructure and compliance with hardware, run the application for load testing, and essentially establish the testbed without impacting the SW developers upstream or the production environment downstream.

The **Release** phase is an important stage in DevOps pipeline where the Build is considered ready for deployment into the production environment after the code has
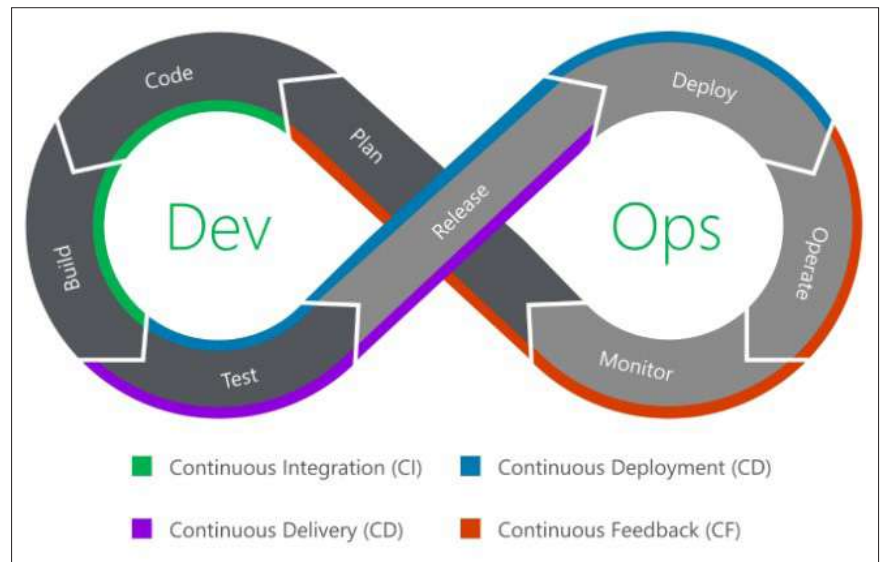

Figure 3: Development & Operations (DevOps) Representation (Ref [2])

passed a series of manual and automated tests. Developers can use feature flags to turn off new features so they can't be seen by the customers until they are ready for action. As per DevOps methodology, Sr. Executives in an organization may manually decide either the minimum criteria for a milestone to be reached or authorize SW release schedule into the production environment.

In the **Deploy** stage, a build is ready for release into production for which several tools and processes can be used to automate the release process and make them reliable with no outage window by using the same Infrastructure-as-Code (IAC) that built the test environment to be configured to build the production environment. The new environment sits alongside the existing production environment and when it is ready, the hosting service points all new requests to the new environment. In case of any issues with the new environment, the hosting service can point requests back to the old environment while the new environment is fixed.

After a new release is live, the **Operate** phase of DevOps kicks in with operations team taking over. Depending on the configuration of the hosting service, the environment automatically scales with load to handle highs and lows in user activity. The feedback from the customers that test and use the application is collected for further improvement.

The final phase of DevOps cycle is to **monitor** the environment, collate the feedback from the customers and provide a dashboard of data analytics on product performance, customer feedback, specific drawbacks, if any based on real world usage. The information is provided to the development team for continuous evolution of the product through its lifecycle.

In Figure 3 (Ref [2]), 4 main aspects of DevOps are shown, viz., Continuous Integration (CI), Continuous Delivery (CD), Continuous Deployment (CD), and Continuous Feedback (CF), essentially emphasizing the core concept of "Continuity" of DevOps.

In the **Continuous Integration (CI)** mode of DevOps, developers can integrate code modifications into the main branch of the code with automatic testing of the integrated code but ensuring the safety of the code in the main body. Owing to multiple developers and often in different locations and time zones, a shared code repository is used to coordinate the SW development, minimize the impact on someone else's code & performance, and merge the changes made by multiple coders on the same piece of code. Continuous integration aligns with the Code and Build phases of the DevOps pipeline and regularly merges a developer's code into the shared code repository and conducts automated testing to ensure that no errors/deviations have been introduced. The emphasis in CI mode is to merge smaller changes of developer's code into the main code successfully, improve overall productivity and avoid bigger surprises later in the development cycle.

The **Continuous Delivery (CD)** mode of DevOps cycle is a natural extension of CI mode wherein code updates are automatically generated, validated, and scheduled to be released. After CI mode, CD mode extends by deploying all code improvements to a testing environment and a production environment after the development process. Continuous Delivery aligns with the Test and Release phases of the pipeline and allows organizations to manually trigger the release of new builds as regularly as they choose.

The **Continuous Deployment (CD)** mode is an advanced version of Continuous Delivery mode but without the manual step of approving new releases into production. Here, each build which passes all the checks and balances of the pipeline are automatically deployed into production.

The **Continuous Feedback (CF) mode** of DevOps helps get feedback from the customers based on their real-world usage, specific inputs from different stakeholders, and data analytics of usage for continuous improvement and better design for next set of changes. The CF mode closes the loop, feeding back data and analytics from the Operate and Monitor phases back into the Plan phase to start over the development cycle.

ADDITIONAL ASPECTS OF DEVOPS THAT NEED MENTION ARE THE FOLLOWING:

Microservices Architecture

As the name indicates, in this architecture used in DevOps, the software code is developed as a continuum of small services and integrated together. Each service manages its own process and interacts with other services with the help of a simplified structure/asset light framework or suitable programming languages. This helps improve productivity, reduce complexity, and quicken resolution of issues.

Version Control Systems

As the name indicates, this standard approach in DevOps handles codes in versions and allows SW developers to work together collaboratively, effectively share the coding tasks among product team members, and optionally save the entire code for fast recovery, as required.

Infrastructure-as-Code (IAC)

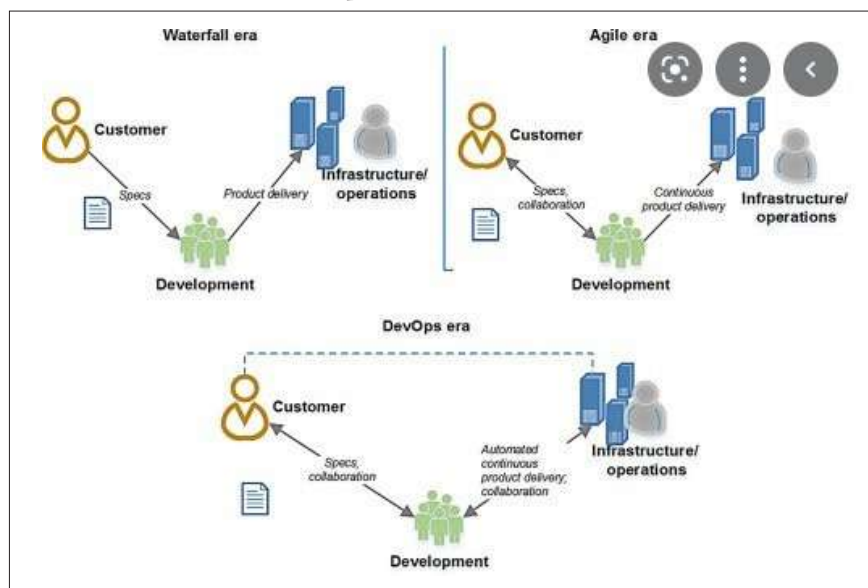The infrastructure-as-code (IAC) facilitates

Figure 4: Evolution of SW Product Development in the Auto Industry (Ref [3])

continuous integration/continuous delivery (CI/CD) aspects of DevOps and is an approach to the management and organization of infrastructure by using scripts to automatically set up a specific configuration of the environment for implementation (networks, virtual machines, etc.), regardless of its initial state.

Monitoring & Logging

This stage of DevOps is used to monitor and check how the performance of applications and systems affects the experience of end-users of products and applications. Also, the user logs are tracked, and data metrics are captured for further analytics. This phase of DevOps is also used to carry out data protection and cybersecurity and ensure data privacy besides understanding how data logs generated by code changes or SW updates or infrastructure changes affect customer response, for further improvement in the product for the next cycle of SW release.

Why DevOps in Automotive Product Development?

Over the past few decades of 100+ years of automotive industry existence, software has become an indispensable part of automotive product development. The auto industry in 2020s is probably going through a similar journey as the IT industry of 1990s and 2000s. Most of the new features or changes in upgradation of existing vehicles or in the launch of new vehicles are "Software centric". There is continued pressure for reduced product delivery timelines. Though the Hardware costs might be going down, the corresponding complexity on SW is increasing with higher levels of reliability demanded by regulators and customers for semi-autonomous and autonomous vehicle features. This is also a great opportunity for auto industry to provide disruption in mobility never seen before.

Many of the vehicles these days boast of few hundred million lines of software code that has become a key differentiator and influencer on vehicle branding, marketing, and buying decisions by the customers. Akin to the many mechanical or mechatronic components in conventional Internal Combustion Engine (ICE) vehicles or the modern Electric vehicles (EVs), modern Software Development Lifecycle (SDLC)
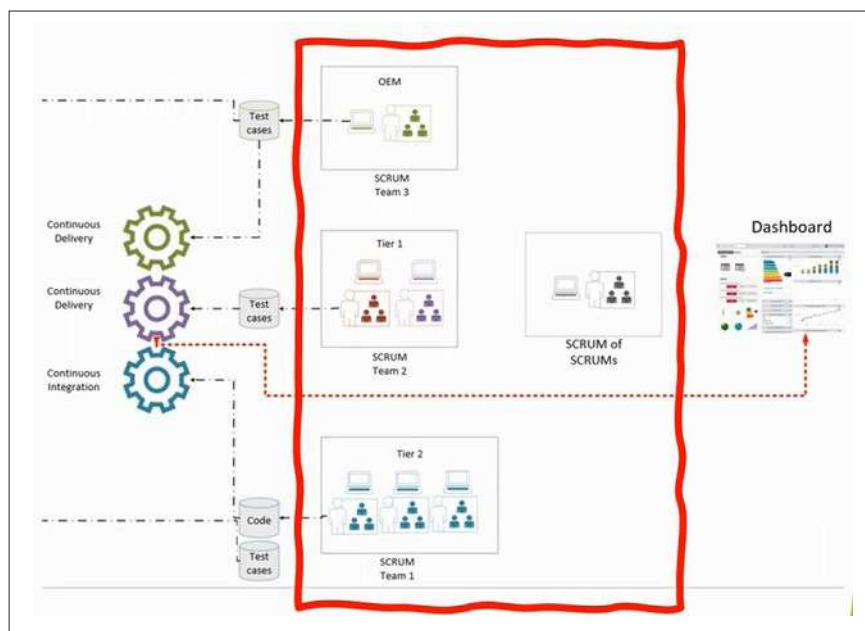

Figure 5: DevOps Schematic for Automotive SW Development (Ref [5])

also consists of many interconnected systems with inputs and outputs. The SDLC includes design, development, and testing at component/system/lab/pilot production level before release for production. A common misconception in the auto industry is, software can be easily reproduced on multiple vehicles and will last forever unlike the mechanical parts that have wear and tear and need to be repaired or replaced. Also, SDLC is usually underestimated by many managers and Sr. Executives in the auto industry with the misconception that SW is easier to create, deliver, and manage. As modern vehicles have multitude of Electronic Control Units (ECUs) to manage different functions, logics, and performance, that are provided by OEMs themselves or Tier 1 or Tier 2 suppliers or SW vendors, the automotive industry has reached a stage where updating, upgrading, improving, and repairing units involves developing and deploying SW updates either physically or remotely and not necessarily fixing hardware issues manually in dealer locations or service centres.

A) EVOLUTION OF AUTOMOTIVE SW DEVELOPMENT
i) *Waterfall & Agile Methodology of Project Management*
Automotive industry has been traditionally using the waterfall methodology for project execution with deliveries passing through series of quality gates with mechanisms

having very little feedback loop (Figure 4, Ref [3]). Many project managers in auto OEMs using waterfall methodology realized that oftentimes there are many unresolved SW issues that need to be resolved though they are just few months away from production. This obviously led to lot of frustration, finger pointing, and sometimes distractions away from the issues that need to be resolved. Automotive companies have since changed to Agile methodology, started having regular stand-up meetings, improved the gap in system testing, caught up on lost time and delivered the project on time or through minimum delays. The system testing approach in many cases is quite sketchy and the customer requirements also go through multiple changes. To avoid project delays, bring better clarity on system testing, and address the changing customer requirements, many companies are adopting A-SPICE methodology and achieving Level 2 or higher-level certification and delivering projects on time and with quality. However, in a good number of projects, the man hours are underestimated and for delivering the project on time, companies must spend many more man hours than originally estimated, leading to significant erosion in revenues and profits. A close study of tool chain and reviews of processes and artifacts may point out the excess amount of man hours that each project associate may be putting into delivering the project on time and with quality to cover up the
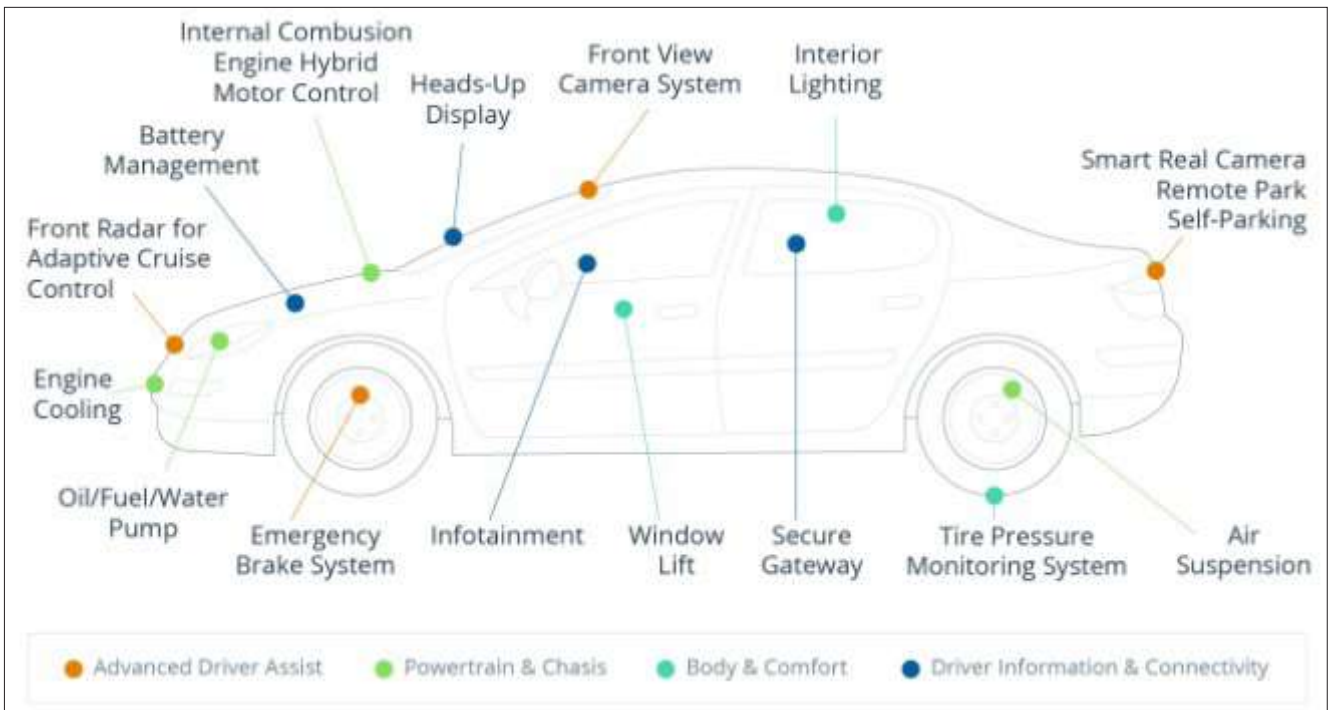
Figure 6: Automotive Embedded Systems (Ref [4])

inefficiencies in the system and improve the processes.

The schematic of Waterfall Automotive SW development in Figure 4 (Ref [3]) shows handover of deliveries across tiers, with customer requirements on the left side and delivery to the customer and feedback on the right side of the V-product development cycle. As we move down from the left side of V-cycle from customer requirements to OEM specs down to Tier 1 Statement of Requirements (SOR) and Tier 2 Scope of Work (SOW), with output coming back to Tier 1 from Tier 2 as code, which in turn comes back to OEM as SW, test data and compliance reports, we realize that it is a lengthy process. The waterfall approach (V-cycle) usually takes few years to deliver a product and few months to fix any issues.

Agile SW development, on the other hand, is flexible, iterative, and involves rolling wave planning and less documentation, but focuses instead on increased demonstration (Figure 4, Ref [3]). The cons of Agile methodology include questions such as 1) do we have enough documentation to cover the regulations, 2) do we have enough resources, and 3) how do we manage the risks if we don't think of them ahead of time?

ii) SW Testing

When it comes to testing, a lot of automotive testing is still manual, with someone writing the test cases and someone else doing the testing against specific inputs, monitoring the outputs, and generating the Pass/Fail test report. System testing happens after internal release – someone has to release the SW, someone else has to flash it, and a system engineer/validation team has to test it and generate the test report. Usually, the test cases are project specific and are not necessarily flexible to be carried over to other projects. The focus is mostly on testing, to check if we have the right inputs, right test setup, right diagnostic tools, and right interpretation of the output and not on test case design. The feedback is still relatively slow, taking anywhere from couple of weeks to few months. After all this, if the test results are not favourable, there is always finger pointing if the right SW version was used with the right HW in the test environment. Also, SW release engineer may say, specific test cases cannot be tested with this version of the SW and hence questions the test output and the report.

iii) Test Setup – Roles & Responsibilities?

Another important question that needs to be answered in Automotive SW Development is "Test Setup" – who owns the Grey Box, White Box, and Black Box testing?? Usually, there is no clear demarcation of SW team and System team roles and responsibilities. Also, this may span across multiple Tier 1 and Tier 2 suppliers, increasing the complexity further. Additionally, there is proliferation and duplication of test setups at OEM, Tier 1, and Tier 2 suppliers as each team wants to independently cross-verify the HW/SW combination and convince themselves. There is a large scope for improvement where there could be a combined strategy to distribute the scope of work and better utilization of test setups at OEM, Tier 1, and Tier 2 suppliers.

iv) Tools for SW Testing

Another important topic in Automotive SW development is "Tools" and "Tool Myths" – On many occasions, it is falsely assumed that all the tools are created equal, are independent of process, and are interchangeable. The myth is that tools are considered the most significant cost item and the least contributing factor. As such, tools are the easiest to go in project budget cuts but as team members remain the same, there is always lost productivity due to some team members waiting for the availability of the tools.

v) End Result

Net result of project management strategy (waterfall, agile), SW tools, SW Testing, and Test Setup is – lengthy product delivery

and defect resolution timeline, nightmares for product teams in tracking, determining root cause, and providing feedback. It is often observed that there are certain areas of SW with over-testing as those areas have tools that are cheap and familiar -- results in wastage of effort through duplication and proliferation. There are other critical areas where there are "gaps in SW testing" and these areas do not get the right attention due to multiple reasons such as 1) SW tools to test these critical areas are probably expensive with limited availability and long waiting period, 2) limited time/under pressure to test the SW to meet project deadlines, 3) potentially reducing the number/frequency of test cases (taking short cuts), resulting in poorly tested and released SW.

Who pays the price? – 1) The end user or customer, who invests in the automobile. 2) OEMs themselves when there is a need for recalls to fix issues in the field – expensive affair.

B) NEED FOR DEVOPS IN AUTOMOTIVE SW DEVELOPMENT

As software plays a critical role in overall vehicle architecture, erroneous code or SW bugs can affect vehicle performance and safety, with many OEMs spending millions of dollars in the recent past on vehicle recalls across the globe. Recent technological enhancements on Development and Operations (DevOps) in the IT industry have opened the doors to the auto industry to quickly create reliable SW that meets and exceeds customers' expectations through automated and continuous integration (CI), continuous delivery (CD), continuous deployment (CD), and continuous feedback (CF) modes, as shown in Figure 3 (Ref [2]). DevOps, with its continuous & collaborative approach, explores new collaborative mechanisms among design engineers, SW developers, code testers, IT operations, and quality assurance teams, resulting in increased trust, quicker feedback/change/check cycle, reliable and accelerated

releases, and faster production deployment (Ref [4]). It eliminates older, slower, and siloed approaches to creating and deploying software. As the auto industry faces multiple challenges in terms of SW development, testing, and deployment, while simultaneously adhering to strict safety and regulations in the local markets where they operate, the methodology of DevOps benefits auto OEMs and suppliers with faster time-to-market, continuous product quality improvement, increased productivity, higher reliability, happier customers, lower development costs, and faster experimentation of SW changes/new feature additions (Figure 5, Ref [5]).

C) CHALLENGES FOR ADOPTION OF DEVOPS IN AUTOMOTIVE SW DEVELOPMENT

Though DevOps have been around for over a decade with early adoption in the IT industry, there are multiple challenges for adoption in the auto industry.

The automotive product development has been using waterfall approach for many decades (Figure 4, Ref [3]), which calls for detailed planning at the beginning of the project. The waterfall approach is very documentation centric and has very fixed delivery timelines. The V-product development cycle is a lengthy process and usually takes few years to deliver a product. Software quality systems like A-Spice attempt to merge this approach with

DevOps by setting up DMAIC (Define, Measure, Analyze, Improve, Control) processes. However, DevOps paired with Agile is found successful for automotive because this combination approaches software as an ever-changing realm and deals well with dynamically changing extraneous factors such as user expectations, environments, and security challenges. Though the Agile + DevOps combination works well for Software as a Service (SaaS), it has limitations while dealing with auto industry that is traditionally used to rigorous planning, Just in Time (JIT) inventory control, Flexible Manufacturing Systems (FMS), and multiple vehicle variants/trim levels. It might be easier to build Software in IT industry in iterations but the same extended to components, sub-systems, and systems in vehicle build is a tall order (Ref [4]).

Another important challenge in the adoption of DevOps in the automotive sector is deeply embedded in the automotive software stack. As can be seen from Figure 6 (Ref [4]), modern vehicles are equipped with dozens of Electronic Control Units (ECUs) with accompanying software for performance, navigation and infotainment, enhanced user experience, and safety, to name a few. Embedded software inherently has multiple limitations such as

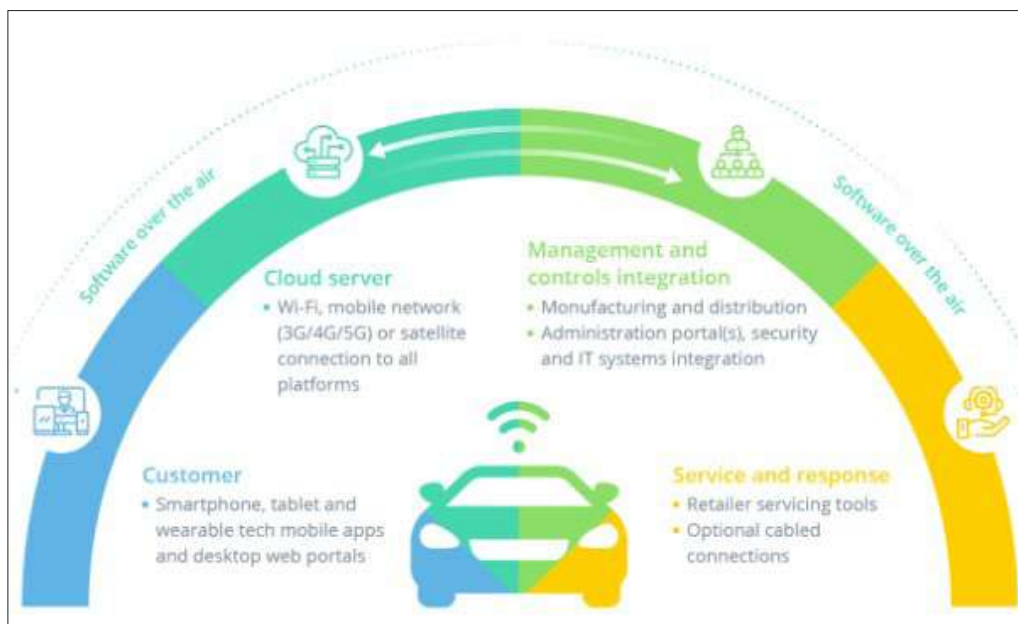a) low computing and memory -- Embedded software must work with a low footprint, leaving no room for orchestrators or

Figure 7: Software Over the Air (OTA) Updates (Ref [4])

extras like hypervisors, loaders, or maintenance-related code.

b) diverse and disconnected tools to handle different ECUs from multiple suppliers -- Despite the efforts by few Automotive players to standardize the ECUs and minimize their number in modern cars, the discrete suppliers of these ECUs are reluctant to lose their competitive edge in embedded SW control systems as they have significant sunk-in development costs and can provide advanced functionality with marginal cost increase and minimum change in Bill of Materials (BOM), which is what the OEMs demand.

c) real-time response requirements -- Real-time embedded software systems must ensure that response times are predictable and aren't dependent on the system condition or conflicting turn of events. To design and verify such systems, very specific software stacks and tools are created with no anticipation of process automation. Even now, over 70% of SW deployments in the auto industry are done manually with little automation, thus leaving little or no room for DevOps automation testing unless the SW stack is changed completely.

d) connectivity issues that are required for Over the Air (OTA) SW updates – auto OEMs have been slowly but surely utilizing V2X architecture and OTA updates but with the much prevalent 4G networks. With the advent of 5G networks and ultra-low latency, DevOps are expected to increase the efficiency of SW delivery cycle through CI/CD loops (Figure 7, Ref [4]).

DevOps for embedded automotive SW faces unique challenges due to the complex testing matrix and deployment processes and the strict safety, regulations, and compliance rules associated with the auto industry. DevOps and CI/CD automation enables automotive manufacturers to accelerate their releases while ensuring security and mitigating the risk of failed/ recalled software releases (Ref [6]).

Key Success Factors for DevOps in Automotive SW Development

The Key Success Factors (KSF) for DevOps in Automotive SW development include (Ref [5])

360 Degree Lean Testing -- Desktop benches, sub-system benches, system benches, and vehicle testing, so there is a scalability and increased complexity as we move from Tier 2 to Tier 1 to OEM with cost advantage at Tier 2, with simpler test setup.

Different Testing Contexts -- MIL/ SIL/HIL/System in Loop/Real World – we need to diversify to use different testing contexts, and if required use even cars in loop. Ideally, we should have progressively complex test setups as we go from Tier 2 Tier 1 OEM.

For successful CI/CD across OEMs and all Tiers, SW tools and test cases will be shared seamlessly over secured network. DevOps will also allow to cross pollinate the test cases so some of the Tier 1 test cases might run in the System context and some of the System test cases can influence Tier 1 testing.

Strong processes
With A-SPICE as the starting point, which helps us with Project Management,

Figure 8: DevOps Quality Assurance Board (Ref [5])

Change Management, Risk Management, Problem Resolution Management, Product Release, and Measurement & Quality Management, it is imperative to build a scalable and agile concept which combines Waterfall project management and Agile methodologies. This will help the teams to plan well ahead of time (at a high level), and also keep it iterative and flexible (at deeper level). This gives rise to a) Scalable Agile (SAF) SW development that combines the best of waterfall + Agile methodologies and b) Scrum of Scrum where OEM, Tier 1 and Tier 2 are combined in Scrum teams and product owners can coordinate SW development using Concurrent Engineering, so no one has to wait for the next one to finalize the specs, a code, or a test case.

Task Monitoring

Build Integrated Ticketing pipelines with the right access and privileges to monitor the workflow, and check who is doing what and who is at what stage of development.

Change of work culture to be more collaborative

In addition to promoting a culture that supports more rapid development, DevOps also makes it possible to achieve more frequent application deployments. DevOps uses automation and reusable techniques to focus more on the strategic elements of the process rather than on routine tasks. The success of DevOps requires an organizational culture shift and is often cited as the most substantial challenge for its adoption.

Quality Assurance Board

Provides dynamic, informative, and integrated feedback on where the roadblocks are. The KPIs of the dashboard include a) SW quality indicators, b) critical failures, and c) delays and dependencies (Figure 8, Ref [5]).

Conclusion

Software has been an important differentiator in branding and customer perception for automotive industry. Many auto OEMs have experienced significant recalls and associated expenses and revenue losses due to software glitches over the past few years, which is getting more complex due to addition of new features and compliance with new regulations. Customers have been demanding and expecting new features and automatic updates in vehicles, but with quality and safety assurance, based on similar experience in the IT and mobile industry. The philosophy of DevOps, with continuous integration and continuous delivery, is the need of the hour, with regular/automatic liquid software over the air (OTA) updates, leveraging 5G networks and advances in cloud computing. Implementing DevOps and cloud in the automotive industry is quite a complex task that requires a lot of time and restructuring of internal processes. The challenges facing DevOps adoption in the auto industry need to be addressed by OEMs, Tier suppliers and SW & tool vendors by formalizing definitions and processes and coming up with standardization of ECUs and electronic components. With continuous updates, advances in cybersecurity, and ultra-low latency from 5G networks, the OEMs will have an opportunity for fixing bugs remotely with little or no recalls, provide enhanced user experience to the customers, and realize the transition to fully autonomous vehicles sooner than later.

Future Work

For successful DevOps adoption in the auto industry, future research should focus on a) wireless OTA software updates and bug fixes, b) ways to inherit best practices from open source such as standardization of APIs and open-source platform and tools, c) dynamic system scaling through automotive-grade virtualization of ECUs and infotainment stack, rapid development of field-programmable gate arrays (FPGAs) and Systems-on-Chip (SOC) and application-specific integrated circuits (ASICs), and automation of SW testing of in-vehicle embedded systems, d) speed up development of standards for DevOps in terms of definitions, processes, and tools, and e) exploit 5G networks and advances in cloud computing for faster, safer, and reliable SW updates (Ref [4], [6]).

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UNLEASHING THE NEW ERA OF SMART FLEET MANAGEMENT WITH IoT

SHWETA BERRY
Aeris Communications India Pvt. Ltd.

The demand for smart fleet management is expected to grow multi-fold in the coming years at the back of rising ask for fuel efficiency combined with high-speed networks. From regional perspective, the APAC region will see rise in lucrative opportunities for smart fleet management and factors supporting this are stringent government regulations, combined with improved transportation facilities and infrastructure. Among various sectors, the automotive and mobility sector has increased the usage of IoT technology to boost their customer experience as well as to steer innovation and development across the fleet management industry. According to the "Indian Internet of Things (IoT) Growth Opportunities" report, the IoT market in India is expected to grow at a compound annual growth rate of 13.2% from 2020 to 2025.

Fleeting forward with IoT

While new-age technologies have continued to strengthen their grasp over our daily lives, there are still some noticeable improvement spots, particularly in terms of cars, trucks, etc. Here, IoT holds great potential to transform this aspect and usher in a new era of smart mobility.

With the help of cellular communications to further transmit necessary information as well as with the added help of technologies like AI, Big Data, Predictive Analytics, etc, IoT also has the power to revolutionize the fleet management industry. In this way, fleet owners are able to keep a track of their vehicle's performance and are able to have informed conversations with their stakeholders.

Tesla Motors' "Over The Air" software update is a good example of how IoT is a gamechanger in terms of fleet management. Recently, the National Highway Traffic Safety Administration in America had published recall announcements, inclusive of one from Tesla Motors, which had

problems that could cause fires. While usually, companies would fulfill the recall activity for such cars, Tesla Motors conducted an "Over the air" software update with the help of IoT technology. This move has become a milestone and a new precedent for what constitutes an automotive recall without the owners being forced to bring their vehicles to the dealer. In the same way, IoT has immense opportunities for Indian automotive companies to enhance their fleet management processes.

Indian adoption of IoT in Fleet management

IoT has immense benefits when it comes to fleet management. However, it is interesting to note that as of now, only 11% of Indian logistics companies are already using IoT for fleet management (according to a 2021 study by HERE Technologies and Frost & Sullivan). This shows that logistics companies are still relying on traditional systems to manage their fleet at a disadvantage.

Seeing the growing need for a better supply chain, tracking, and monitoring, the report indicates that two out of five logistics companies are planning to implement IoT solutions across assets over the next two years. Doing so will help such companies improve their location data and location-based services, achieving real-time tracking and improving operational efficiency.

Another promising sector is the last mile delivery sector in India which is on a steady upward trajectory. It is estimated to a market size of $6 billion by 2024 (Redseer report). India's last mile delivery constitutes of FMCG, e-commerce, retail and other categories. The last-mile delivery contributes a significant 30% of the total cost of shipments in the e-commerce sector. From the buyer's perspective, last-mile delivery is one of the most crucial aspects of every business. In the distributor-retailer led business, it is critical to ensure that supplies reach the market on time, every time. Indian leading footwear manufacturer Paragon owns a large number of fleets moving across the country. They were regularly receiving complains on the delay in transportation of goods, which was directly affecting their sales and consumer satisfaction. They were also facing losses due to fuel pilferages, frequent unexpected breakdowns and poor mileage leading to unpleasing incidents

with the drivers. This led to the search for a technology-based solution to track and monitor Paragon fleets remotely, in real-time to prevent vehicle misuse, idle time of trucks and even driver behaviour. After due diligence, Paragon selected Sify and its IoT partner - Aeris Communications, India to make Paragon's national wide fleet a connected fleet. Mr. Abraham Chacko, Associate Vice President, Paragon shared that with the successful deployment of Aeris and Sify integrated IoT solution, they now have an advantage of minimizing the idle time, tracking the vehicle in real time, control and take timely action on the misuse of the vehicle in case driver takes a wrong route, quick loading /unloading based on the vehicle arriving information etc. This has significantly improved efficiency of their distribution channel and dropped the number of complaints on late shipments.

Another interesting use case of IoT technology creating USP's for fleet enterprises is that of SmartE, India's first and largest electric mobility service. The company provides an environmentally sustainable solution to the first and last mile transportation opportunity in urban cities. SmartE has laced its EV fleets with Aeris technology to make its fleet smart and provide the most convenient, transparent and economical short distance travel solution.

IoT is also enabling municipal corporations transform their citizen services by brining efficiency in operations. The solid waste management department of oldest municipal institution in India uses AerTrak by Aeris Communications for route planning and real time tracking of garbage collector vans at any time of the day & from anywhere. With the rapid increase in population and concern of better management of the waste production, municipality was looking forward to making their waste collection process

With IoT holding the potential to reinvent fleet management, we can expect a new era of smart mobility to take its own course

more efficient cost friendly. Department was spending money, but the result was vague, and citizens were highly dissatisfied. With Aeris connected technology, the fleet of electric vehicles (EV) deployed as garbage vans became smart fleet. Aeris technology enabled automatic setup of the optimum pick-up routes that helped saving fuel consumption, worker's efforts, reduced operational cost significantly while improving citizen experience of waste management services delivered!

What the future holds

In this new world order, new-age technologies like IoT serve as a facilitator, which reduces the communication gap and time lag to delivery between businesses and their customers. With IoT holding the potential to reinvent fleet management, we can expect a new era of smart mobility to take its own course. It will be exciting to see how the Indian automotive, mobility, and the last mile delivery sectors can take advantage of this as well as their global counterparts. ❑

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SOFTWARE, NOT HORSEPOWER, WILL DIFFERENTIATE CARS OF THE FUTURE

✎ **DR. HANS PUVOGEL**
Parkopedia

The way in which vehicles interact with drivers' daily lives is changing. The rapid growth of connected vehicle technology has dramatically changed the way in which vehicles are designed, developed and manufactured, with code and computing power now becoming the fundamental focus of next-generation vehicles.

The global connected vehicle market is expected to treble in size by 2027 to $49bn. Leading automotive manufacturers are already exploring how to capitalise on both the technology and growing demand, with 100% of new vehicles currently being built in Europe and North America being 'connected'.

In fact, every second vehicle on US and European roads in total will be connected by 2025, with China and Japan to follow shortly after, according to PWC's 2021 Digital Auto Report. Automakers, who have previously differentiated themselves from each other by their mechanical features, such as horsepower and torque, now have an opportunity to look to integrated software solutions to appeal to consumers who are increasingly looking for their vehicles to provide valuable features, that not only complement their daily lives with

driver-assistance features, but also tailor these services to their individual needs.

VW Group CEO, Herbert Diess, recently commented that the German marque will have to "completely change to a digital company", if it's to remain competitive in a fast-changing market, and that the VW of the future won't simply just make cars, it will have to continually develop software to run them as devices.

Drivers are looking for automakers to provide the technology necessary to ensure positive future user experiences, such as finding real-time available parking and EV charging, frictionless in-car commerce

through enhanced functionality, and the introduction of autonomous systems - all integrated via their vehicle's infotainment systems.

Automakers are facing an industrial shift in vehicle development, with the focus now firmly on their integrated software. The transition to electric powertrains and autonomous systems is pushing automakers to rethink not only their model line up, but also their roles as manufacturers, and how they will differentiate their vehicles from their competitors' offerings in the future.

Retaining driver loyalty

McKinsey's study on trendsetting car buyers shows that 40% of respondents are willing to change car brands simply for better connectivity features. It is becoming evident that the ability to remain connected is no longer a luxury for most consumers - it is an expectation, and one that now also applies when travelling by car. Consistently strong consumer demand continues to make connectivity features a priority for buyers, with automakers striving to offer the latest innovations in this area.

McKinsey's research also suggests that autonomous driving will open even greater new opportunities for connectivity features, with respondents stating that they expect that with autonomous driving, they would use the infotainment system (including for movies and music) for roughly 20% of their travel time, an additional 8% for online shopping, and the rest talking to other people in the car, sleeping, or simply looking out of the window.

In a future where professional drivers and chauffeurs have the potential to be replaced by autonomous self-driving systems, car owners will have much higher expectations of in-car entertainment - greatly in excess of smartphone levels of functionality through their infotainment screens, with the added benefits of deep vehicle systems integration for heightened convenience, comfort and safety requirements. Automakers who can successfully incorporate future mobility and convenience features together into their vehicles today, will undoubtedly appeal to tomorrow's customers. The challenge now for the automakers is to recognise which features drivers really want and how to ensure that the data these features are built on is reliable enough to deliver repeatable positive user experiences.

Biometrics

The introduction of vehicles with keyless ignition has caused an increase in thefts, which has become a major issue for automakers. Biometric-based authentication, which involves the use of biological markers, such as fingerprints or facial recognition, can provide a more secure and potentially lifesaving alternative. Wellness tracking, where sensors in the steering wheel can detect changes in heart rate, stress levels, and even fatigue, is actively being pursued by automakers. Wellness tracking could ensure greater safety, as the car would be able to forewarn the driver of any cognitive impairment that could greatly affect safe driving - combined with active ADAS systems, this would provide a key safety feature for autonomous driving systems, and potentially prevent the many accidents every year caused by medical emergencies at the wheel.

The use cases for biometrics can also be extended to ride-hailing firms, as these can be used to identify both drivers and passengers, as well as a method of prevention

for 'friendly fraud'. Now vehicles have the ability to store payment information, car sharing can lead to using a family member's information to make payments for vehicle-centric services or e-commerce products from behind the wheel. Biometrics in this instance would be a definitive way in which automakers can complete secure purchases within in-car commerce.

In-car commerce

Entirely centred around driver's needs while behind the wheel, in-car commerce is currently one of the leading in-car focuses for automakers who are looking to optimise their driver's user experience. However, OEMs need solutions that can work almost anywhere, ideally globally, and for vehicle-centric services such as parking, EV charging, fuelling and tolling, a North American or a European wide solution can easily mean having to deal with hundreds of merchants in dynamic markets. Today, automotive OEMs are not equipped to manage this scale of fragmentation and complexity in markets outside their core business.

A number of in-car marketplaces have been launched - in particular in North America. However, many of these have garnered very little driver engagement, and transaction volumes remain limited. The industry is going through a learning curve when it comes to in-car commerce, however, one initial observation is obvious - user experience is key.

To create true value for their users with in-car payments, carmakers have to deliver against the specifics of the driver experience. The in-car payment experience also needs to be comprehensive, efficient and integrated, and any viable in-car payment solution must aggregate multiple merchants and provide sufficient coverage of transactable locations to make it worthwhile for drivers.

To make in-car payments successful, the entire user experience needs to be complete and deeply integrated with the navigation, including locations without transaction capabilities. A frictionless solution requires centralized user management, with Single Sign-On (SSO) capabilities across all merchants, covering all connected car services and the associated payments. This SSO setup needs to be frictionless and consistent for the driver across all commerce domains. The payments need

to be seamless too - orchestrated across the plethora of payment service providers and without additional enforced customer authentication at the point of sale. The driver should not have to pull out a smartphone to approve a payment, the in-car solution should take care of that.

Telematics

Telematics can be invaluable for both safety and driver convenience. By monitoring vehicle location, routes and driving style, automakers can provide personalised services, as well as predictive maintenance. Vehicle-to-everything (V2X) will be hugely beneficial for navigation-routing and vehicle-to-vehicle communication by allowing a car's centralised back-end servers to calculate the best routes using the most recent road and traffic conditions. The information used to calculate instant re-routing can also be shared back to servers and between other drivers, as can information such as poor road conditions, road closures and parking space availability.

Alongside traffic and weather, parking is the most requested driver information service. Every driver's journey begins and ends with parking, however, automakers who don't already prioritise parking, or are content with poor quality data, are creating negative user experiences for their drivers. Research found that motorists can spend up to 90 hours every year looking for parking in major cities. Smart parking solutions are necessary to reduce the time spent looking for parking, unwarranted consumption of fuel, and to reduce greenhouse gas emissions.

Parking data will also form the basis of many next-generation connected vehicle payment and mobility services - from the adoption of electric vehicles to automatic parking payments and autonomous driving. Ensuring this data meets auto-grade standards will be paramount to future driver user experiences.

Ensuring data accuracy

In-car systems of the future need accurate, granular and comprehensive data to support highly automated vehicle-centric transactions - parking, fuelling, tolling and EV charging currently hold the biggest opportunity for car manufacturers. The more seamless and automated in-car transactions are, the higher the benefits for the user and also the car manufacturers and merchants in delivering more convenient experiences that give drivers the option to easily order, reserve and make payments safely and efficiently from their vehicles.

The success of future technology will depend on the quality of the data it is built on. When collecting large amounts of data, accuracy can sometimes be lost. As the global leader in digital parking services, Parkopedia's database of parking spaces around the world now exceeds 70 million, in 15,000 cities across 89 countries. As well as frequent testing to maintain the accuracy and completeness of the data, Parkopedia is continually working to close any gaps in coverage, such as within indoor and underground facilities, and in less populated areas.

Parkopedia's data collection includes gathering dozens of static parking data attributes for every location including the precise location, as well as details on the number of spaces, prices, hours of operation, electric vehicle charge points, height restrictions and more. By leveraging parking payment transaction data, digital imagery and vehicle sensor data to provide highest quality predictions, Parkopedia's dynamic data provides space occupancy information, as well as "probability to find parking" by individual street segments and for off-street parking facilities.

To ensure the quality of data when it comes to coverage, completeness, and accuracy, Ground Truth Testing (GTT) is an important tool for the automotive industry and mapping providers by helping them evaluate quality amongst data providers by exposing the level of correctness and accuracy across both static and dynamic attributes by visiting multiple locations and comparing the information available from the data provider with the information available at the locations. While this process may seem simplistic, evaluating Point of Interest (POI) data is a complex and crucial process that requires planning to give a consistent and fair evaluation between competing suppliers.

Leveraging data to delight drivers

Connected vehicles in the future will be defined by data. Either the data that its services are built on, or the data collected from the driver's engagement with the vehicle or provided services. By leveraging the data collected from the vehicles themselves, automakers are able to produce a customised and engaging interface for drivers which will encourage positive in-vehicle user experiences. In the competitive world of connected vehicles, automakers need to continually improve their driver touchpoints to maximize their user experiences. By doing so, they will retain existing owners, appeal to new customers, and continue to capitalise on demands for the latest services and technology.

Automakers leveraging vehicle sensor data will be critical to future success, not only in terms of prompting drivers in real-time to generate engagement and interaction, but also to provide hugely valuable insights into in-car user behavior which will help optimize the in-car commerce propositions and overall experience. The ability to harvest real-time usage scenarios offers potentially huge savings in R&D budgets, while user data can expedite hundreds of hours of in-car software testing, and monitor acceptance of additional systems, such as voice assistants, automated personal preferences with AI technology, context-aware vehicle services and 'useful' driver prompts enabled by deeply integrated systems. Making sense of vehicle data to create great user experiences and unique experiences will be the key differential in terms of future customer loyalty and potential monetization. ❑

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Real competition is Diesel counterparts

🖋 **VITAN JAGADA**
Astro Motors

Today, when consumers look at the Commercial EVs available in the market, they see them not as a replacement for their diesel vehicles, but as an add-on for trips less than 20km. This seems fair for someone, who uses vehicles for his commercial transport where ange of 50- 70km under 400kg of payload is required.

On the other hand, their diesel 3 three wheelers maybe required to carry 1000 kg and run for 100-120 kms daily. If you are a food and beverages vendor (who form 40% of all 3 wheeler cargo vehicles users) you need to reach your location 50km away within a time limit, come back to your godown and go on another trip for 40-50 km right away. And continue this at least 3 times during a single day.

EV fleet operators have come up with a solution to use more vehicles. For example, if one does a 50km round trip and put the vehicle for charging, and use another vehicle to continue the trips.

After seeing these challenges, those who can only afford one vehicle is taking a step back in using electric three-wheelers.

If this wasn't enough the breakdown and service issues faced with startup OEMs and even with automotive giants have led to a very unpleasant user review by the drivers and fleet operators.

It started when the Delhi market started deploying and using Chinese assembly EVs which were cheap and quick buck were made by importers and resellers who heavily promoted the model where they supply the vehicles knocked down and also get it homologated from iCAT and get the centre and state subsidies. It was a lucrative business model for some fabricators or vehicle body builder who were in some way related to metal or vehicle building. Sales of vehicles costing less than two lakh with lead-acid batteries flourished due to low cost of purchase and operation. But after sometime came the maintenance monster. After two years nothing was repairable, everything that went wrong had to be replaced only.

Importers and resellers gradually faded out and only 5 to 7 electric three wheeler manufacturers were left. In a market where 1.5 lakh units are sold, only 2000 are electric. The market is quickly evolving and adapting to the needs of the consumers, and experimenting with various solutions.

Startup OEMs like Triyaan, Grevol, Euler and Altigreen are moving towards higher payload (750 -800kg) and high ranges, over 100 km per full charge. Omega Seiki with Log 9 Batteries and Altigreen with Exponent energy are the latest innovations in Battery as a Service technology along with DC fast charging, giving a range of 70km in 25 minutes of charging time. Startups in the L5 cargo electric space are receiving great support from child part manufacturers, government and fleet operators to expedite the trials of new technology and establish sustainable manufacturing rapidly.

Battery is the Heart and motor controller is the Brain of the Vehicle

For batteries and motor controllers, OEMs are still completely dependent on China. However, Chinese products procured with scrutiny and R&D are not always of the best quality. We cannot say with confidence that in the near future when the demand rises exponentially, procurement will also not be a big issue.

To compete with diesel vehicles, electric vehicle has to be reliable, with less breakdown under Indian circumstances. We need to develop this two heart and brain in India and for India. If powertrain suppliers like Virya and Compage join forces with startup OEMs, these can be developed locally and tried and tested to perfection.

One positive aspect of this Industry is that every startup OEM is accepting its own shortcomings and supporting others when required as the market is very nascent. We have to build a robust supply chain with good quality, steady and sufficient production capacity.

The second biggest problem with shifting to EVs is the lack of charging infrastructure, for example, Triyaan is the first vehicle to be doing Intercity runs (Mumbai-Nashik-Pune). Now, I need a fast charger at 150 km from any distance to peacefully reach my destination after charging for 30 minutes or a battery swap twice from city A to city B. For nearly 1000 EV cargos to travel daily on the same route, I need at least 500 charging stations between these 3 cities.

Consumers in this line of business cannot risk delaying their cargo in any circumstances. If there is no on-road assistance or support available 24x7 It does not really promote using EVs for distances exceeding 50kms.

EV fleet operators like SKS CleanTech and Magenta are providing the solution to this problem by offering Mobility as a Service. So consumers have a first-hand experience of how the vehicle performs, what challenges one may face as an Individual, and what are the solutions suiting their personal problem statement.

How can he optimize his route for the EV so as to not run out of battery and reach all destinations with some backup remaining? We, as an OEM, train each and every driver for 3 days to get acquainted with the new vehicle and can get maximum efficiency out of it.

Also, to teach them if there are petty issues how can they diagnose and solve the problem in order to significantly reduce the downtime. ❑

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VITAN JAGADA
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He is the founder of Astro-Triyaan, his team has been working to build a better product where the end user of the IC engine vehicle wouldn't have to compromise too much while shifting to a cleaner means of transport which is also at least 10 times more economical than its ICE counterpart. They have achieved some notable success even as a small startup in the Industry.

Smart Temperature & Environment Monitoring Solution – IOTfying the Pharma & Food Logistics Industry

⛰ **ASHISH CHINTHAL**
Napino Auto & Electronics Ltd

The need for technology to improve the business processes was always felt but many organizations were fence-sitters when it came to its adoption, more so in pharma and food logistics. The pandemic has infact pushed most organizations to adopt IoT-based technology to drive operational efficiency by reducing wastages, improving tracking and predictability of their supply chain. The demand has also surged where monitoring the indoor environment conditions, adjusting the storage temperature, or controlling the ambient conditions are vital to maintain

business uptime and optimize business profitability.

As per market research estimates, the global asset tracking market is expected to grow to $ 32 Billion by the end of 2025, out of which the cold chain monitoring market is going to be $ 10 Billion. The logistics industry with the implementation of IoT is growing at a CAGR of 17% for cold chain monitoring alone.

A Smart Tracking and Environment Monitoring (STEM) device is an environmental parameters logger. It records the live GPS location, ambient temperature, humidity, pressure, goods mishandling, tampering of the package, and several other parameters. It assures correct handling of goods throughout the supply chain.

Implementing STEM based solutions will help organizations in discarding the damaged products reaching the customers thereby eliminating the cost of handling returns which not only is compensatory monetary claims but also brand image and

reputation.

The data loggers for pharma logistics should be compact, portable, relatively inexpensive, and be able to work without any fixed cables & infrastructure. Battery-powered STEM is an ideal solution to track cold storage shipments in transit.

There are enough trends and evidence which indicate that soon we will be required to store and transport goods over long distances at ultra-cold temperatures, which could be even below-average temperatures of Antarctica.

With these changes in the market requirements, the STEM device also needs to evolve to work under extreme environmental conditions and stay connected to the cloud platform through multiple options on connectivity such as 4G,5G, LoRa, NB-IoT, and more.

Irrespective of the choice of STEM features you go for in the Pharma & Food logistics; these are the top five non-negotiable factors that should drive your

selection of the STEM device:

Accuracy of the Temperature reading

The temperature sensor used in the STEM device will determine the accuracy of the reading of the STEM device. While there are regular sensors at one end but there are also NIST-certified sensors that are certified by a non-regulatory agency of US department of commerce for sensor's accuracy of the reading.

Temperature accuracy requirements vary widely among different vaccines and pharmaceutical logistics. Typically, a temperature reading range of -30 degrees C to +80 degrees C would cover for most applications.

Additional Sensor Capabilities

The advanced cold chain data loggers can't stop at only measuring temperature. Having sensors to measure additional data points like humidity, location, air pressure, tampering, physical shock is crucial for validation and assurance of a failproof Supply chain. These built-in sensors make the STEM device adaptable to customized needs and applications.

The list of sensors doesn't end here, it can also measure acceleration, orientation, angular velocity, altitude, etc. Generally, the logistics industry focuses more on location & speed while the FMCG industry focuses more on temperature & humidity.

Operating Life of the Device

STEM device is available as single-use and multiple-use. The single-use is relatively low on cost as it doesn't come with a built-in battery but its usage is limited to single-use. The multiple-use device can be recharged and used multiple times.

The size of the battery and the configuration of sensor data upload time interval will determine the operating Life of the device once enabled to start capturing the data.

The configuration of the data upload interval can be the basis of the usage application. Like, if you're using the STEM to track temperature-sensitive pharmaceutical shipments, you could set the recording interval to 5 seconds or less.

However, if you're using the STEM to track food shipments, you could set the interval to 10 minutes or more.

Typically 4000mAh with 10-sec data upload interval would give 200 days of operating Life which would meet most applications.

Reliability and Data Security

TEM's onboard memory and battery backup, with the ability to log data offline on the dedicated storage, ensure the sensor data parameters are logged even when the cloud connectivity is lost.

Secure cloud storage, notification system, remote reporting of analytics, insights, and alerts go a long way in the practical usability of the device.

Supported cloud connectivity options

Based on the practical usage of the STEM device the cloud connectivity can be over BLE, Wi-Fi, Cellular 2G/3G/4G/5G, LoRa, NB-IoT, CAT-M, LPWAN, LTE-M, Satellite etc.

The choice of Connectivity will require a specific module to be included in the STEM device adding for the device cost and additionally the service cost should be factored in for expenses towards the connectivity services.

Applications of STEM in other walks of life:

Pet/Kid/Elderly tracking

Location tracking of our near and dear ones for their safety is one of the most widely adopted applications of STEM.

With additional features such as geo-fencing and immovability/fall detection, it is now possible to get real-time alerts to address any emergency needs.

Immovable Objects Tracking

For many industries such as real estate, Highways, ports, oil & gas, and the life-saving health care industry there is a need for real-time tracking of critical assets ranging from heavy machinery & equipment. Also in our day-to-day lives enterprises need to track laptops, printers, trolleys, shipments, etc.

With STEM-based solutions, the utilization can be significantly improved and even the access can be made much faster through real-time visibility on the location and availability.

Vehicle Telematics / Movable Objects Tracking

Vehicles, Robots, Drones – all of them have mobility applications where the basic requirement is to sense environmental parameters such as current location, environmental conditions, video feeds, Telematics information such as battery/fuel level, acceleration/velocity, etc.

STEM devices can capture all of these parameters with the help of sensors and feed the information to the cloud platform over multiple remote connectivity options. ❑

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AUTONOMOUS MOBILITY LED SMART PARKING TRENDS

🖊 **JYOTSANA SINGH, SUNITHA MISRA & GOPINATH SELVARAJ**
Tata Elxsi

Autonomous vehicles with smart parking technology have seen significant interest and demand over the past two decades. As per various reports, in the journey to achieve full autonomous vehicles parking specific solutions will be deployed earlier as compared to autonomous driving. The automated parking system market is estimated to grow at a CAGR of 13.1% from 2019 and 2027 to reach USD 3.6 Billion by 2027, as reported by marketsandmarkets. Consumers constantly look for features that enhance comfort, safety and reduce time while parking in constrained spaces. Business providers for residential complexes, offices, supermarkets, malls,

and retail shops are constantly looking for effective parking space utilization, better control of traffic flow through the parking lots, and eliminating queues for parking.

These factors have contributed to an influx of smart parking technology in the automotive industry, hence the demand for solutions that cater to various needs.

Challenges & Current Trends

As per SAE levels of automation, there are 6 levels of automation. Level 0 requires maximum human intervention with the least automation, and Level 5 requires no human intervention with the highest automation, hence meeting the requirement

of a truly autonomous vehicle.

Currently, they are multiple smart parking solutions available in the market. However, most of these solutions are still at Level 2, with some players at Level 3+. Even though multiple Level 2 smart parking solutions exist in the market, these solutions do not provide an architecture that can be easily scaled, customized, and quickly deployed to the market.

The advent of technology megatrends like CASE has disrupted the automotive industry. As we move forward, there will be a requirement for continuous exchange of information between vehicles and infrastructure, requiring ultra-low latency and high bandwidth networks. Over the

Figure 1 SAE Levels of Automation

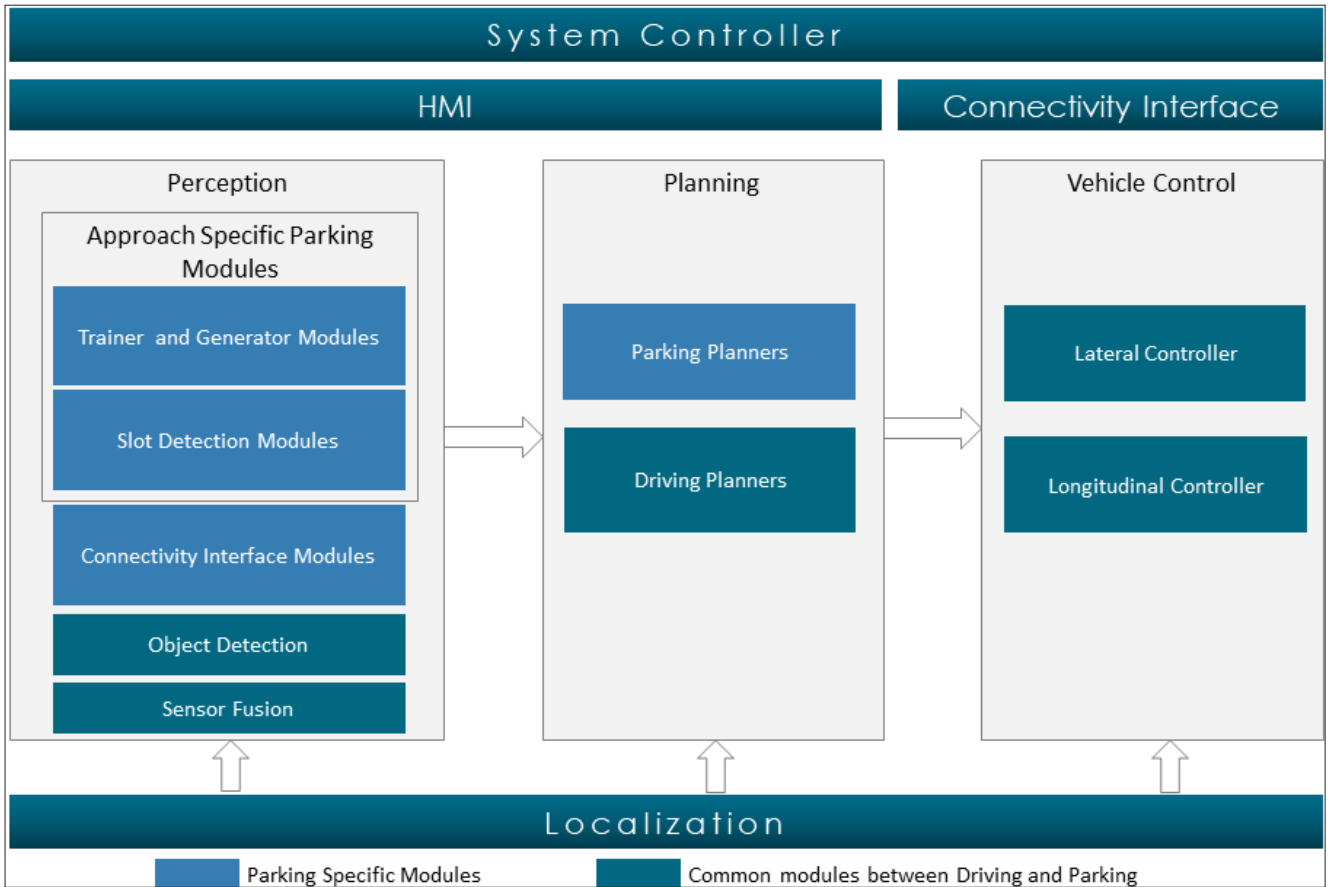**Figure 2** Smart Parking Solution Challenges

Figure 3 High-Level Autonomous Software Architecture

past decade, there has been a continuous upgrade of cellular networks, and 5G has been the latest cellular network. The introduction of 5G will significantly impact autonomous vehicles and, henceforth, significantly improve smart parking technologies. CASE has also resulted in demand for increasing computation power and hence the requirement for distributing computation between vehicle and cloud. Upcoming years will see a gradual transition where software within the vehicle will be updated over-the-air (OTA). In order to facilitate this, the software has to be modular, allowing upgrades of individual components.

The above factors lead OEMs and Tier 1s to migrate to next-gen in-vehicle architectures of domain consolidation, domain fusion, high-performance vehicle computers, and vehicle cloud computing. Hence, OEMs and Tier 1s are constantly looking for quick-to-deploy market solutions to address all the challenges listed above

and adapt easily to upcoming automotive trends.

Proposed Solution

Smart parking solutions need to have the capability to utilize the onboard sensors and interact with smart parking infrastructure in real-time; to monitor available parking slots and assist in parking without causing any discomfort to the driver and damage to the vehicle.

To address the above needs, smart parking solutions need to have a modular and scalable architecture that can be quickly deployed to market by doing minor customization based on different parking environments, geographic regions, parking infrastructure support, existing sensor configuration on the vehicle, and SAE level of automation. Additionally, the same solution should be easily scalable to autonomous driving. The below diagram provides a generalized

Figure 4 Smart Parking Software

Figure 5 Parking Deployment Strategy

architecture of an autonomous vehicle with smart parking technology.

Realizing the need for such architectures, Tata Elxsi's smart parking is one such solution which addresses all the above needs. As part of this solution, four smart parking approaches are packaged in a single solution.

Park by Memory: Aimed at making frequently used routes and parking procedures more convenient (Ex. Home, Office)

Parking Slot Detection: Intelligent parking solution to assist the driver in figuring the availability of the slots by detecting slot lines and checking occupancy of the spaces. Utilizes existing sensors like surround-view camera and ultrasonic sensor on the vehicle.

Infrastructure Parking: Infrastructure parking solutions utilize sensors mounted on infrastructure in conjunction with vehicle sensors, thereby reducing the number of onboard sensors on the vehicle

Autonomous valet parking: An intelligent valet parking solution targeted for Level 4+. This solution can be used in conditions where parking infrastructure support is unavailable.

We propose a phased deployment approach based on the availability of vehicle-mounted sensors and parking infrastructure support.

Conclusion

A smart parking solution will help resolve traffic congestion and make parking smoother for the driver. In addition, OEMs and solution providers have been focusing on various features providing improved comfort and safety features in a vehicle in response to consumer demands.

Deployment of multiple smart parking solutions in the market looks to be in the near future, with multiple players expected to be ready with such solutions.

Even though these solutions are ready for deployment, we need to keep in mind how the current smart parking architecture will meet the upcoming trends of CASE, new cellular networks, OTA, next gen vehicle architecture, and the final goal of achieving autonomous driving.

OEMs/Tier 1s will find smart parking software architecture by Tata Elxsi as an efficient and cost-effective solution suited to efficient platform development.

With a collaboration of different automotive industry giants, government organizations, private companies - smart parking technology with an efficient architecture could be the next big thing. ❏

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Transforming Fleets with Video Telematics Technology

✍ **TUSHAR BHAGAT**
Uffizio India Pvt. Ltd.

Introduction

The telematics industry is developing and adopting new technologies with each passing day. As a matter of fact, it has undergone a resounding revolution with the advent of advanced video telematics technology. This enables fleet managers to know and keep up with their fleets. It also makes fleets and their drivers safer than ever and gives fleet managers 360° transparency.

Video telematics deploys a growing number of safety functions which are specifically designed to enhance driver passenger, driver, and pedestrian safety. Hence, encouraging fleet managers globally to optimize their fleets with such revolutionary technologies.

Any fleet manager that prioritizes safety in their organization opts for a video telematics solution. The cost of accidents of commercial vehicles are higher than in any other category of road vehicle. Data plotted on the graph below proves it:

Such cost of accidents affect businesses in more ways than one, which is why there is a dire need for video telematics solutions. Road accidents mean repair expenses, driver injuries, lower productivity, and higher insurance premiums. Hence, the impact of these accidents is more devastating than one may think.

Why do we need video telematics?

Adding cameras to a fleet management system has changed the way one monitors their fleet. Experience beyond simple tracking with the future of telematics: advanced driver assistance systems (ADAS) and driver monitoring systems (DMS). With such tools, fleet managers can access real-time telemetry data through a single screen in video formats. Not only can they reduce business inefficiency but also zoom into critical issues with video telematics.

AI-enabled dashcams, road-facing, or rear-view cameras can help your drivers make the tough decisions on the road. It may be merging into a highway, changing lanes, or backing up from a tight parking spot—video telematics tools can help your driver make smarter, safer road decisions. ADAS & DMS can slash down accident risks and protect your drivers by enforcing safety norms.

How does it work?

Video telematics is a technology that monitors and compiles a wide range of data from a fleet, including location, speeding, harsh braking, engine diagnostics, fuel efficiency, harsh acceleration, idling time, and more in video format. Combining video equipment like dashcams , LIDAR, or SONAR sensors with vehicle analytics provides a more holistic view to fleet managers.

With the help of this, the system can easily record and review everything happening in and around the vehicle, including traffic, the environment, and driver behavior. Video recording can be valuable in case of accidents and other events happening during the overall journey. ADAS and DMS warn drivers of potential dangers and can help them correct their actions before it's too late.

A combination of sensors and cameras can enhance fleet safety. It can also help drivers navigate safely through rush-hour roads as well as long highway hours. ADAS predicts a possible collision and warns drivers about it. Here's a list of warnings that can be generated by ADAS. Keep reading to learn what they mean:

Forward Collision Warning (FCW)

With the help of road-facing cameras and sensors, ADAS scans the road and traffic conditions. If your vehicle is too close to the car ahead of you and yet you continue traveling at a speed at which a collision is guaranteed, then the warning will be triggered. It notifies you only when you tailgate or don't hit the brakes even after you see the car in front of you slowing down. The notifications come several seconds before the collision happens–so drivers can react and avert it.

Lane Departure Warning (LDW)

Reckless lane changes and departures can lead to brutal accidents. Sometimes, reckless lane departure is done consciously—by reckless driving habits. Other times, it

Cost of Accident (COA) vs. Transport type
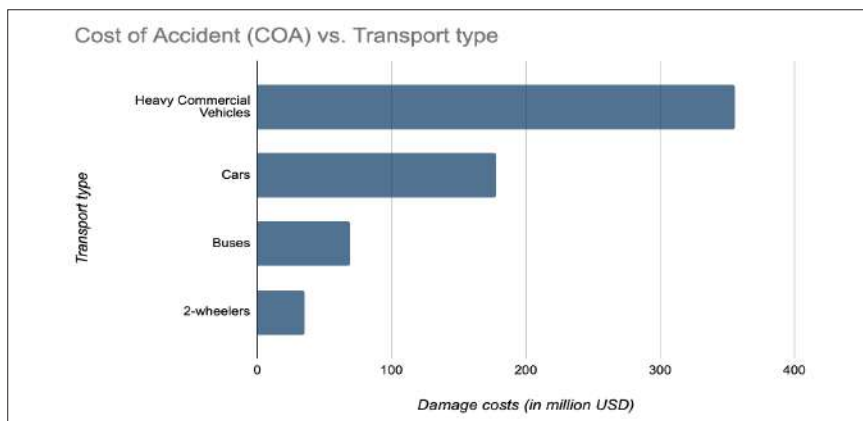
happens when the driver is incapacitated because of a lack of sleep. In such scenarios, Lane Departure warnings can be of great help. It alerts the driver when they drift off their lane. The warnings continue until the driver takes corrective actions.

Pedestrian Collision Warning (PCW)

With the help of artificial intelligence technology, ADAS recognizes pedestrians and bicyclists on the road. It issues the Pedestrian collision warning when the possibility of a frontal crash with a pedestrian is detected. Some advanced systems may automatically apply the brakes and reduce the fleet's speed to mitigate the risk of a collision.

Forward Vehicle Start Alert (FVSA)

Being stuck in slow-moving traffic can be exhausting. Sometimes, drivers may get distracted and not even notice when the traffic begins to move. Here, the Forward vehicle start alert can prove to be helpful. Every time a vehicle at the front starts moving after breaking or a halt, it notifies you.

Headway monitoring Warning (HWM)

Leaving enough braking distance is the key to avoiding rear-ended collisions. ADAS' forward collision warning does exactly this. It helps you maintain a safe headway distance. Many drivers underestimate the amount of time they need to stop their vehicles. Heavy commercial vehicles take longer to stop when compared to a sedan. So, the HMW is issued when the headway is distance is below the defined threshold.

Traffic Sign Recognition Warning (TSR)

Dashcams equipped with image processing and identification technology can interpret traffic signs and signals. For instance, when your driver doesn't stop at a red light, the system will identify a traffic rule violation and record it. If you're a fleet manager, you'll get notified via email or SMS.

Benefits of Video Telematics

One of the biggest benefits of having any video telematics solution in your system is the ability to witness the things inside and outside the vehicle which were not possible earlier. With the telematics solution, we're able to provide answers to the when and where of a vehicle accident. But with video telematics, the fleet managers can get answers to the why and how of that accident too. Video telematics provides fleet managers with a real-time view into

the driver's seat, ensuring better safety of vehicles and drivers.

Holistic insights

Earlier when accidents happened, the fleet management systems could only provide information like time, speed and location of the vehicles. But questions like "was the driver paying attention during the journey?" or "who was at the fault during the accident?" remained unanswered. With the help of video telematics fleet managers can now answer those questions. They get a bigger and clearer picture of an accident and can find out the root cause. Thus, saving millions of dollars in accidental damage and avoiding significant reputational damage due to delays.

Driver improvement

The ability to see things virtually around incidents results in a higher understanding of root causes. It enhances the ability of drivers and fleet managers alike to take necessary actions. By doing so to save you from any such similar recurrence. Making use of video telematics from real an-real incidents as a part of driver training can help drivers to become more aware of the blind spots and allow them to enhance their awareness and skills on the roads.

In-fleet monitoring

Video telematics can detect and report unnecessary or unsafe driver behaviors in real-time. Know what your drivers are doing, how well they're driving, and the level of their alertness. Instantly review the real-time footage once alerted. For instance: if your driver uses a cellphone, smokes in the car, or dozes off while driving—you

get notified. Such insights can prevent unfortunate accidents and help you coach drivers.

Fewer Expenses

Having video telematics can help you access multiple data and information regarding your fleets. This will help you identify issues and reduce the number of accidents. Fewer accidents mean lower insurance premiums and timely delivery of manufactured goods. Besides, monitoring driver behaviors with DMS will help you lengthen your vehicle's life. For example, set alerts for inappropriate gear shifts or tailgating and get notifications via video telematics tools. Not only will your drivers practice road safety but also eco-driving.

Conclusion

Video telematics systems are already the fastest-growing segment in the field of fleet telematics and it will witness a major growth in the near future. The value proposition and return on such a technological investment is honestly incalculable. Not to mention its effect on the safety of drivers and fleets. Video telematics can help businesses clip off inefficiencies. It can keep your drivers safe and maximize productivity. So, what are you waiting for? Integrate video telematics into your fleet management platform today! ❑

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Tushar Bhagat is the CEO of Uffizio. He has simmered 15 years worth of informatics knowledge & experience into a one-of-a-kind telematics platform. This fleet management system has been acclaimed and widely used by businesses in over 60 countries. He firmly believes in finding creative solutions to everyday challenges—so businesses can bloom into their full potential.

THE FUTURE OF AUTOMOTIVE INDUSTRY IS ELECTRIC AND AUTONOMOUS

BHAVANEESH ATHIKARY
Hexagon

The socially conscientious customer today has made the switch from price-conscious purchasing to buying products that reflect their ideologies. From FMCG products, this trend is quickly making its way onto the personal vehicle market, as reflected by the rising popularity of electric vehicles. Government sanctions and the growing awareness of the effects of fossil fuel production and use has also driven car manufacturers to heavily invest in the research and development of electric vehicles. While innovation is accelerating the journey towards a cleaner and more sustainable future in the domain of mobility, the automotive industry is also rallying to meet the demanding deadlines and customer specifications for new vehicles.

Another important shift to be expected in road vehicles is the advent of autonomous vehicles. With several large warehouses across the globe investing in autonomous trucks etc., the age of autonomous road vehicles is not far away. The massive rate of electrification has also propelled carmakers to invest in R&D of autonomy since it is easier to implement autonomous features on electrified vehicles. As a result, electric vehicles are strongly accelerating the growth of autonomous vehicles.

Consumers are driven by technology and social awareness and demand both innovations within the same vehicle. Electric vehicles are built with drive-by-wire systems that replace traditional mechanical control systems with electronic controls. These enable the easy implementation of autonomous driving technologies. In addition, the fast-paced developments in battery technology, increase in range, increase in reliability of electric vehicles, will accelerate the speed at which autonomous vehicles can be developed.

Electrification – driving innovations in manufacturing

EVs are predicted to represent a third of the automotive market by 2025 and 51% by 2030.

Therefore, the automotive market landscape is evolving rapidly, with this change being driven not just by large household names but by new players. Some of these new players are content with low order volumes and using learnings to build their manufacturing workflows from the ground up; implementing newer smart technologies even in their manufacturing processes. This leaves conventional carmakers lagging behind newer companies that are more used to rapid innovation cycles and face low barriers because consumers expect more integrated digital technologies. Since new car designs render as many as 90% of automotive parts from existing ICE vehicles redundant, their strategies are less reliant on current supply chains and mass-manufacturing plants. The research finds that only 8% of carmakers see pure-play EV manufacturers as a threat, yet Tesla is already the market leader for battery electric vehicles (BEVs), while the likes of Lucid rapidly are scaling up with vertically-integrated EV production.

In contrast, data reveals a disconnect in the equivalent progress towards digital transformation by larger OEMs. While there has been a definite uptick in interest around "smart" automotive manufacturing, the research shows that recognition of its value is not always accompanied by implementation. Instead, the data reveals that the industry sees sourcing the required volume of parts and the inability to achieve economies of scale as the greatest perceived

2025 — China — 25% of vehicles to be electric

2030 — Japan — 23-33% electric passenger vehicles

2035 — California (USA) — No new gasoline or diesel powered passenger cars

2050 — Germany — 100% electric passenger vehicles

risk to the success of EV supply chains.

The challenges that automakers face aren't always external. To make EVs more affordable at current order volumes while also delivering greater choice or 'cars-to-order', traditional high volume manufacturing lines need to transform more agile manufacturing infrastructure. They need to be built around speed to market. This can be challenging for incumbents, especially if they are still required to achieve the required profit margins.

Therefore, automotive OEMs must reconfigure traditional manufacturing business models to prioritise flexibility over process, empowering people with more integrated processes and greater automation.

To achieve this, there needs to be vertical integration of the development and manufacturing processes. At the same time, a deep focus on digital design and manufacturing approaches is key to agility. This transition isn't easy since it necessitates a cultural shift within the organisation in addition to technology investments. OEMs are already making progress in this direction.

Overall, the data shows that there is growing interest in smart manufacturing approaches that apply pervasive connectivity, cloud and edge computing with momentum in data analytics, AI and robotics affirming that the industry is on the threshold of unprecedented change with very different ideas and levels of maturity on the journey to Industry 4.0. The convergence of these additional technologies will act as an adoption catalyst, with OEMs and their supply chains trying to adapt to this change as they evolve with the market.

Smart Manufacturing – Accelerating electrification

With the industry completely focused on the pivot to electric vehicles, manufacturing intelligence solutions like Hexagon are committing their resources, and innovations to build and optimize smart manufacturing solutions to accelerate the evolution and adoption of electric and autonomous mobility.

The low volume demand currently and an eagerness among venture capitalists to invest in electric mobility technologies has given smaller players a massive advantage in the current electric vehicle market. These smaller technology disruptors are taking advantage of the low entry barriers and also revolutionising manufacturing techniques with an agile development approach. To stay relevant in a rapidly changing market landscape like this one, the industry must adapt and reimagines processes and workflows that are currently used and taken for granted.

Hexagon recognises the opportunity that this offers to the automotive industry to drop the traditional volume-based approaches and completely revolutionize manufacturing by embracing intelligent solutions. Research from Wards Intelligence suggests that smart manufacturing, not scale, may be the key to success in the electric vehicle pivot. Hexagon's smart manufacturing technologies provide several solutions for eMobility providers to optimise and validate battery designs using CAE simulation, ensure robust battery manufacturing processes with process simulation and execution tools, and verify components and battery systems through non-contact inspection and non-destructive testing techniques.

Examples on the ground

HV. Wooding, a key player in the renewable energy space has implemented Hexagon's smart sheet metal cutting simulation software to optimize its production of components used in big-name car marques; supercar manufacturers; supercar e-racing; electric motorbike GP racing throughout Europe; railways; aerospace; and increasingly electric buses, construction and agricultural vehicles. In addition to drastically reducing their time to market for new customized components, the company also uses Hexagon's RADAN to quote prices and timelines for manufacturing, thus bringing great certainty into their manufacturing projections.

The acquisition of Romax Technology has also enhanced Hexagon's product suite in the electromechanical drivetrain design and simulation space. simulating the operation of the entire system - engine, gears, bearings and housings - the efficiency of automobile, aerospace and wind turbine powertrains can be optimised, and the battery range of electric vehicles can be increased. The acquisition of Romax Technology enables Hexagon to meet the growing need for electrification, by providing our customers with integrated tools to develop the next generation of energy-efficient electric vehicles.

Another disruptor, Helix Technologies, implemented antenna designs using electro ceramics, printed with toolpaths on a bespoke scientific laser lithography processing machine programmed by Hexagon's ALPHACAM, to synchronise information from multiple networks through the GNSS (Global Navigation Satellite Systems).

The way ahead

At Hexagon, we've created the 100% EV initiative to accelerate the successful pivot to electrification in the automotive industry. Hexagon aims to offer a new set of smart manufacturing technologies for eMobility, blending our experience in automotive design and engineering, production and metrology to help you make the journey toward 100%EV faster and more cost-effective.

With our expertise and deep knowledge of best practices from automotive, electronics and other key industries, together we will make the production of electric vehicles easier, increasing your productivity, lowering your costs and reducing time to market. Hexagon aims to drive its holistic approach to benefit manufacturing experiences, as well as the environment, the result being a smarter, more sustainable world for us all. ❏

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HOW NEW-AGE COMPANIES ARE REDEFINING THE AUTO INDUSTRY INTO A SOFTWARE DRIVEN INDUSTRY

✎ **UDIPTYA PAL**
Teradata

The Shift

Tesla is not a typical automaker. In most ways it closely resembles a Silicon Valley technology start-up. Traditional Auto companies, "the metal benders" are adept at making complex reliable products at massive scale, but the software experience in those products is still not as sophisticated as we experience every day in our mobile devices, gaming consoles, smart wearables etc.

Very soon, we may see well known Auto brands – the likes of VW, Toyota, FCA, GM join the list of Silicon Valley technology companies.

But why? Why can't auto companies focus on building good cars and let their tech partners/suppliers build the software for the cars?

The reason for this paradigm shift in the auto industry is the competition from clean sheet companies who are changing the rule of the game - Tesla, Lucid, Rivian, Nio. They have embraced technology at their core. This has completely changed the relative importance of software vis-à-vis hardware in a vehicle. The customer and market acceptance of this new future paradigm is also reflected in the market valuation of some of these companies.

The Learning Car

We have been used to consider the car as a depreciating asset, where the car starts getting degraded from the day it is driven out of the showroom - it is a downhill road. But not anymore.

Companies like Tesla are improving the performance of their cars over time by intelligently using the data collected

and through frequent over the air updates (OTA). One recent example is Tesla increasing the performance of its Autopilot system significantly over a period of 18 months (refer figure). The Autopilot performance almost doubled in the period of 18 months, whereas the performance of active safety features remained almost the same.

This is their true edge; the software core turns every Tesla car into a learning machine. Their global fleet of cars have collected data of 3bn+ miles, have identified multiple edge scenarios and done over 120 OTA updates since 2017, that's on an average one update every 16 days. These updates have added new features like Smart Summon (valet service), added performance like additional 40 BHP to Model-S, added support for new content like Netflix and fixes and updates to systems like BMS, braking, Autopilot etc. This is a huge game changer.

For other car companies, these would

have meant expensive and messy recalls and update or may not be simply possible in the existing vehicles.

This concept of products getting better over time is not at all new – we are so used to it in our smart phones, smart TVs, tablets, PCs – they add functionalities, content, bug fixes through updates. But the automotive industry was alien to this concept till recently – almost all car models used to deteriorate from the time they roll out of the show room. Also, these products were disconnected from our digital life, unlike our other smart devices.

The ship is turning

The ICE industry has grown by outsourcing subsystems, including software and the processing compute hardware. Some of the major OEMs have outsourced nearly 90% of the software which goes into their cars. To make software and data analytics as the core of the industry, it calls for a significant

change in the way the existing OEMs function.

This is not lost on the major Auto players. Some of the major Auto giants like Volkswagen and others have made commitments to build software and data analytics to their core. Companies like VW, GM, Toyota, Hyundai, FCA are making large investments towards making this shift. There are multiple inorganic acquisitions which the OEMs are doing in related spaces to quickly ramp-up their capability. But it is a huge leap ahead for traditional Auto companies. There needs to be a huge shift in culture, skills, processes and many more of the legacy thinking.

The vehicle design and manufacturing process has generally been quite linear with a typical lead time of 2-3 years for a new product and there is not much learning built into the vehicle. Software development process is quite different than this.

The mechanism of collecting huge amount of data from the products on the field, to capture the edge cases, to better understand how the product is being used in the field, to map newer requirements and continually improve the product is not new. This process of continuous learning by collecting large sets of data and improving the product is baked into everything from a small mobile game to the largest software platforms on the planet, it is part of mobile phones, large industrial machines, smart TVs etc. For these gadgets and devices, we frequently get updates over the air for newer features, capabilities, contents, bug fixes or for improving performance.

Till recently, this was alien to the Auto industry, but now this is changing, and we are seeing software updates for cars being transmitted over the air (OTA) to do similar things. Earlier, we have seen that the software updates are being applied when the car visits the service centers. But, with the advent of EVs, the need for service visits have drastically reduced, hence OTA is the only viable way. OTA updates solve all the above problems by eliminating the need for software-related recalls and make software updates easy and seamless. OEMs simply send the updates and patches over the internet so that the cars can download and install them on their own.

OTA updates broadly target two major types of systems : infotainment and drive control/transmission.

The infotainment updates include patches for map upgrades, application enhancements, content addition etc. Drive control updates typically include security patches, feature upgrades or additions, updates to ADAS, drive train, chassis control etc. They are also used for activating features on demand – like BMW owners can now activate heated seats and steering wheels during winter months at a subscription payment and disable it when not needed.

The Data Conundrum and the Secret Sauce

All of this calls for appreciating a very fundamental issue. The scale, speed and complexity of data from the vehicles and the need for analysing that data in conjunction with the enterprise data of Bill of Material (BoM), customer master, parts & service masters, service history, data from multiple customer facing channels etc., as well as externally sourced datasets like weather, geo locations, government or municipal data on traffic, road conditions etc. A typical ADAS equipped car would generate roughly 1TB of raw data per day. A vehicle fleet of 100 thousand such cars would generate 100 petabyte of raw data per day! That's a lot of data to store and analyse.

There are decisions on which data to extract and store, what is the cost of storage, who gets access to what data, what will be the design of the data transfer pipeline, what advanced analytical algorithms can be used, which architecture will perform at such scale, which platform has the ability to handle unstructured and semi-structured data and many more such.

There is a need to architect and build a data pipeline that can manage exabyte scale data. Which can collect and intelligently sift out important data elements and then link those with enterprise data for the analysts to work on using advanced pattern recognition and other machine learning and AI techniques. Managing this data deluge intelligently will be a critical capability for OEMs to succeed in this race.

Partnering with the right data and analytics partner is key to solve these and compete successfully in the software and data driven automotive industry of future. ❑

The views, thoughts, and opinions expressed in the article are done solely by the author in his personal capacity, and do not necessarily represent those of the author's employer, organization, committee or other group or individual.

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Hyundai Venue

SX Plus 1.0 Turbo DCT Dual Tone

Hyundai Venue SX Plus 1.0 Turbo DCT Dual Tone is the top model in the Venue lineup and the price of Venue top model is ₹11.88 Lakh. It returns a certified mileage of 18.15 kmpl.

SPECIFICATIONS

Safety Features:
- Overspeed Warning - 1 beep over 80kmph, Continuous beeps over 120kmph
- 2 Airbags (Driver, Passenger)
- Tyre Pressure Monitoring System (TPMS)
- Child Seat Anchor Points
- Seat Belt Warning

Engine & Transmission:
- Fuel Type – Petrol
- Max Power - 118 bhp @ 6000 rpm
- Max Torque - 172 Nm @ 1500 rpm
- Drivetrain – FWD
- Transmission - Automatic (Dual Clutch) - 7 Gears, Manual Override & Paddle Shift
- Emission Standard – BS6
- Turbocharger
- Idle Start/Stop

Braking & Traction:
- Anti-Lock Braking System (ABS)
- Electronic Brake-force Distribution (EBD)
- Brake Assist (BA)
- Electronic Stability Program (ESP)

- Hill Hold Control
- Traction Control System (TC/TCS)

Locks & Security Features:
- Engine immobilizer
- Central Locking - Keyless
- Speed Sensing Door Lock
- Child Safety Lock

Telematics Features:
- Find My Car
- Check Vehicle Status Via App
- Geo-Fence
- Emergency Call
- Remote AC On/Off Via app
- Remote Car Lock/Unlock Via app

Entertainment, Information & Communication Features:
- Smart Connectivity - Android Auto, Apple Car Play
- Integrated (in-dash) Music System
- Touch-Screen Display
- GPS Navigation System
- 6+ Speakers
- Steering mounted controls

- USB Compatibility
- Aux Compatibility
- Bluetooth Compatibility (Phone & Audio Streaming)
- AM/FM Radio
- Wireless Charger
- Steering mounted controls
- Voice Command
- iPod Compatibility

Instrumentation:
- Analogue Instrument Cluster
- Electronic 2 Trips Meter
- Average Fuel Consumption
- Average Speed
- Distance to Empty
- Digital Clock
- Low Fuel Level Warning
- Door Ajar Warning
- Adjustable Cluster Brightness
- Gear Indicator
- Dynamic Shift Indicator
- Analogue – Tachometer

Mercedes-Benz Maybach S-Class
S 680 4MATIC (W223)

Mercedes-Benz India launched the much-anticipated Maybach S-Class at a starting price of Rs 2.5 Crore in India on 3rd March. The Maybach S-Class offers top-of-the-line features and luxurious environment. The new Maybach S-Class is the company's first launch in Indian in 2022.

SPECIFICATIONS

Safety Features:
- Lane Departure Warning
- Emergency Brake Light Flashing
- Forward Collision Warning (FCW)
- Automatic Emergency Braking (AEB)
- High-beam Assist
- Blind Spot Detection
- Lane Departure Prevention
- Overspeed Warning - 1 beep over 80kmph, Continuous beeps over 120kmph
- 10 Airbags (Driver, Front Passenger, 2 Curtain, Driver Side, Front Passenger Side, 2 Rear Passenger Side, 2 Rear Passenger Seatbelt)
- Tyre Pressure Monitoring System (TPMS)
- Child Seat Anchor Points
- Seat Belt Warning

Engine & Transmission:
- Fuel Type – Petrol
- Max Power - 603 bhp @ 5250 rpm
- Max Torque - 900 Nm @ 2000 rpm
- Drivetrain – RWD
- Transmission - Automatic (Torque Converter) - 9 Gears, Sport Mode
- Emission Standard – BS6
- Turbocharger - Twin Turbo
- Regenerative Braking, Idle Start/Stop

Braking & Traction:
- Anti-Lock Braking System (ABS)
- Electronic Brake-force Distribution (EBD)
- Brake Assist (BA)
- Electronic Stability Program (ESP)
- Hill Hold Control
- Traction Control System (TC/TCS)
- Ride Height Adjustment

Locks & Security Features:
- Engine immobilizer
- Central Locking - Keyless
- Speed Sensing Door Lock
- Child Safety Lock

Telematics Features:
- Find My Car
- Check Vehicle Status Via App
- Geo-Fence
- Emergency Call
- Over The Air (OTA) Updates
- Remote Car Lock/Unlock Via app
- Remote Car Light Flashing & Honking Via app

Entertainment, Information & Communication Features:
- Smart Connectivity - Android Auto, Apple Car Play
- Integrated (in-dash) Music System
- LCD Display
- GPS Navigation System
- 6+ Speakers
- Steering mounted controls
- USB Compatibility
- Aux Compatibility
- Bluetooth Compatibility (Phone & Audio Streaming)
- AM/FM Radio
- Wireless Charger
- Steering mounted controls
- Voice Command
- Display Screen for Rear Passengers
- CD Player
- DVD Playback
- iPod Compatibility
- Internal Hard-drive

Instrumentation:
- Digital Instrument Cluster
- Electronic 2 Trips Meter
- Average Fuel Consumption
- Average Speed
- Distance to Empty
- Analogue Clock
- Low Fuel Level Warning
- Door Ajar Warning
- Adjustable Cluster Brightness
- Gear Indicator
- Dynamic Shift Indicator
- Heads Up Display (HUD)
- Digital – Tachometer
- Instantaneous Consumption

CONNECTED VEHICLE: FEATURES & TRENDS

✎ **RICHA TYAGI**
Telematics Wire

The automotive industry is witnessing a radical change with car manufacturers introducing new technologies that seem to be pulled straight from the future. The modern carmakers are investing heavily in developing their own operating systems and apps which they have offered in almost all their products. Connected cars have become the new norm in the automobile industry, and we can only expect it to get safer and convenient. Connected cars designs are being continuously refined, making them more ergonomic and futuristic. Today, connected car comes with many convenient and smart features. These features help to improve the overall driving experience, make travel safer, reduce congestion and provide real-time information, and also add a safety net with its advanced safety features. Below are some of the feature update of connected vehicle:

Internet

A connected car owns its connection to the Internet via an embedded chipset or SIM Card, provided there is a stable wireless network coverage. Connected Vehicles can also provide download over-the-air updates issued by the manufacturer and provides access to other online apps and services.

Hyundai has come up with an inbuilt Vodafone-Idea eSIM card for its compact SUV Venue. The SUV does not require the user's smartphone to be connected to a plethora of options like entertainment, navigation and emergency response, etc.

MG Motors has entered the race with an SUV named Hector with an embedded SIM card from Airtel.

Embedded eSIMs identify individual vehicles, encrypt communications and ensure secure global connectivity to smart vehicle systems including eCall emergency solutions, vehicle telematics, navigation and more.

eSIM has already been selected by the European Commission to form a part of the emergency call system in the car.

As per GSMA, eSIM would help car manufacturers to offer any type of in-car connected service through SIM, which can be provisioned with the profile of the mobile operator after the car is shipped, as well as at the end of the contract, without the SIM needs to be changed.

Apps

Connected vehicles are equipped with dedicated smartphone applications, which connect to the vehicle via a wireless network. These apps allow users to remotely operate car functions such as locking/unlocking doors, opening the sunroof, engine start/stop, climate control, headlight on/off and horn sound. The app will also help in locating the car through the on-board GPS. Google Maps, Scanner Radio-Police Scanner, Autovaras: Android Car Assistant, Spotify: Music and Podcasts, Telegram, Audible: audiobooks & podcasts, Waze:GPS, maps, traffic alerts, & live navigation, Pocket Casts, TomTom GO Navigation, Poweramp Music Player, TuneIn Radio, Player for Rainwave etc. are some apps that you can use by integrating your phone with Android Auto or Apple Car Play to the car's entertainment syatem.

Recently, Cerence Inc. partnered with HARMAN to voice-enable third-party applications available in the HARMAN Ignite Store. With Cerence AI-powered voice recognition, automakers deploying the HARMAN Ignite Store can offer hands-free, secure access to the platform's broad capabilities, bringing a seamless, powerful experience to their drivers. Cerence is providing speech recognition and natural language understanding technology that will integrate with the apps in the Ignite store so that drivers can nab any of the apps that interest them without taking their hands off the wheel.

Geofencing

Geofencing defines a geographic area to track vehicles if they are entering or leaving that area. In geofencing, the system uses GPS technology, and also uses other data signals, including cellular and WiFi.

In India, Tata has launched Tata IRA Connected Technology platform with geo-fencing feature in some models like Tata Altroz, Tata Punch, Tata Nexon, Tata Safari which enhances the convenience and safety of Tata car.Don't just define what is Geofencing, get an update on what's happening in this space wrt CV.

V2V/V2X

Vehicle to Vehicle (V2V) or Vehicle to Everything (V2X) technologies allow vehicles to communicate with each other. V2V enables sharing of important information such as traffic movement, road conditions, speed limits and much more. According to a new research report from the IoT analyst firm Berg Insight, there were about 0.7 million cars with V2X capabilities on the roads at the end of 2020. This number is expected to grow to 35.1 million by 2025. Communications between vehicles has been discussed for more than two decades, but with few implementations.

In 2013, Mercedes-Benz launched Car-to-X communication, the radio-based exchange of information between vehicles, as well as between vehicles and traffic infrastructure. The system will receive

information from points outside the driver's field of vision. Now, Mercedes-Benz has integrated a new pothole alert function to its "Car-to-X" communication system. According to the company, the newly inducted technology enables the drivers to receive real-time warnings about potential dangers on the road. The company said that potholes are a real safety hazard that can cause damage to a vehicle's tires or suspension.

In June 2021, Elektrobit has added two important elements to its Classic Autosar product line. These are designed to provide automotive manufacturers and suppliers with a solution for ISO 15118-compliant communication between electric vehicles and charging stations. The solution simplifies and accelerates the development of next-generation electric vehicles with the advanced vehicle-to-grid (V2G) capabilities required by ISO 15118 in an Autosar electronic vehicle control unit development environment.

In June 2021, Keysight Technologies announced the Keysight C-V2X Autonomous Drive Emulation (ADE) solution, which enables functional, protocol and radio frequency measurements on 3GPP Release14 C-V2X devices from the Keysight UXM 5G Wireless Test platform. In June 2021, Jacobs, Peachtree Corners and Qualcomm Technologies have been working together on deploying the company's technology solutions, focusing on roadside infrastructure, traffic management and road safety, with the implementation of Cellular Vehicle-to-Everything (C-V2X) technology. As part of the program, the city will work with Commsignia to facilitate roadside units (RSUs) equipped with Qualcomm Technologies' C-V2X solution. Utility vehicles equipped with Qualcomm Technologies' C-V2X solutions will also be used to demonstrate vehicle-to-infrastructure (V2I) direct communications.

In April 2021, Suzuki Motor Corporation, Subaru Corporation, Daihatsu Motor Co. Ltd., Toyota Motor Corporation, and Mazda Motor Corporation signed an agreement to jointly develop technical specifications for next-generation vehicle communications devices. It will promote the common use of communication systems using connected services to connect automobiles and society, with the aim of creating new appeal, value and services to be standardized for the initial provision of safer and more convenient connected services.

Entertainment

In connected vehicle you can connect your smartphone to a host of pre-loaded entertainment services or apps. We have moved ahead from connectivity through mobile phone to embedded SIM in infotainment panel. You can enjoy music, internet radio and watch videos. Apart from this, you can also connect your smartphone to the car's infotainment system through the app and remotely control the audio/video. The in-car combination of smart software with stable 4G and advanced 5G cellular networks is a tremendous opportunity to increase time spent in transit and, as we are seeing, is already unlocking the future of automotive infotainment.

In Janaury 2022, Porsche is enhancing its infotainment system for many of its models. The latest, sixth generation of Porsche Communication Management standard in the 911, Taycan, Cayenne and Panamera models now has many new functions. These include the direct integration of Spotify as a media source for the first time, a revamped interface design, additional optimization of Voice Pilot voice assistant, wireless Android Auto connection and – especially for the Taycan – improvements for planning charging stops. In September 2021, The Fesco Group introduced the Intellidash Pro, the much-anticipated wireless version in a series of plug-and-play dashboard-mounted IPS touchscreen smart displays, in partnership with Car and Driver magazine. Intellidash Pro allows drivers to wirelessly integrate their smartphones for the complete Apple CarPlay and Android Auto experience. Owners of older model cars can also enjoy the luxury of advanced technology without buying a new car or investing in expensive hardware installations. The installation of Intellidash Pro is easy: drivers simply mount the unit on the dashboard, plug it into a 12-volt port, and link their phone. There is also an add-on backup camera that will automatically engage when the vehicle is put in reverse.

In June 2021, Toyota Motor North America has introduced a new multimedia solution. The new system features multiple touchscreen options from 8- inches up-to 14-inches, which all feature the same newly advanced design cues and functionality, while retaining a volume knob. The system also provides five times the processing power of the previous generation system, an incredible leap in processing capacity that provides faster and more responsive touch functionality. All screens feature modern designs with optically bonded, glare reduction technology, allowing for a customer experience that reflects smartphone-like capability. Native navigation system with 100% cloud capability allows faster, more accurate direction and mapping. The OTA update will allow real-time updates for navigation mapping, enriched media experiences and other enhancements throughout the system's lifetime.

In May 2021, DTS®, a wholly owned subsidiary of Xperi Holding Corporation, and Südwestrundfunk (SWR), announced the integration of ARD-Eventhub metadata distribution platform with DTS AutoStage™, a hybrid radio platform to be commercialized around the world, currently supporting operations in 60 countries. The integration means that all broadcaster metadata on the ARD platform for SWR stations, such as program information, station logos, album/artist imagery, etc., will be displayed accurately, consistently and seamlessly across the DTS Autostage ecosystem. It offers a state-of-the-art in-vehicle entertainment experience to German owners of vehicles supporting DTS AutoStage platform, such as Mercedes-Benz S-Class.

Remote Parking & Payments

As the name of the feature suggests, some high-end connected cars even allow you to park the vehicle remotely. Using a app or the smart key fob, you can get out of your vehicle and manoeuvre the car to park it at the desired location. This feature will come in handy in tight parking spaces and when you are not sure about parking the car in a very congested area.

In August 2021, Oobeo launched a new event parking app to complement its existing parking software suite for fast cash and card payments at events including contactless payment methods such as Apple Pay and Google wallet.In June 2021,

Parkopedia announced its suite of off-street parking services, including reservations and digital payments, is available to both Toyota and Lexus drivers in North America. The 'Park with Parkopedia' service is integrated into Toyota and Lexus smartphone apps and vehicle infotainment systems to provide drivers a complete parking experience, allowing drivers to locate, reserve and pay for parking.

In August 2021, The Passport Parking app helps efficiently and conveniently manage parking sessions through the smartphones, eliminating the need to carry change or interact with public surfaces. After downloading the free app, a user enters the respective zone number, a license plate number and the desired length of time for parking. Users can receive notifications when their session ends and view receipts and parking history directly from their smartphones.

Safety

Connected vehicles are enabled with several important safety features like real-time location sharing/tracking, emergency SOS calls in case of an accident, roadside assistance in case of vehicle breakdown and much more. In addition to the on-board security tools, these smart safety features come in handy in difficult situations.

Autoliv is using HERE Speed Limits, Fleet Telematics and Weather APIs for its Connected Safety Services. Autoliv is developing Connected Safety Services, which aim to tackle another crucial factor for road fatalities: driving behavior. Real-time data from the driver's smart phone is used to analyze driving styles and recommend improvements in four key areas: speed, focus, smoothness and turns with the Autoliv Driver Safety Score software.

Wejo and Waycare will deliver a joint offering to 20 geographies across the United States. Wejo's data will supplement Waycare's existing traffic data sources, giving the myriad agencies responsible for the safety of U.S. roadways with a comprehensive understanding of conditions and the ability to not only detect and predict incidents, but also respond faster and more effectively based on real-world, near real-time data in a single platform allowing them all to collaborate.

In April 2021, Fraikin UK has partnered with Samsara to surface real-time data that will help customers improve the safety, efficiency and sustainability of their connected fleets. Samsara's Connected Operations Platform collects rich data including distance travelled, speed rate, fuel efficiency, diagnostic fault codes and distracted driving indicators. Real-time visibility into this information can transform fleet operations by streamlining billing, reducing vehicle downtime and preventing accidents.

Fleet Management System

SDL solutions are based on a secure cloud infrastructure that allows customers to collect, process, analyze and transmit data on hundreds of thousands of "connected" cars. SDL has developed its own telematics module, theft prevention solutions, a mapping service, scoring systems, a ready to use basic solutions for creating fintech products, a professional fleet management portal, and custom mobile applications for car owners and drivers.

Volvo Trucks North America has introduced route planning and connected technology tools to support customers in successfully deploying Volvo VNR Electric Class 8 models into their fleet operations. The new technologies tools are designed to help customers maximize performance capabilities and benefits of the zero-tailpipe emission Volvo VNR Electric model.

ResearchAndMarkets.com study reveals new findings about the market for IoT connectivity management platforms (CMPs), a standard component in the value proposition from mobile operators and IoT MVNOs (Mobile Virtual Network Operator) around the world. Recent developments in network virtualisation, SIM technology and LPWA networking are currently driving the market shift towards a greater diversity of IoT connectivity management services. About 67 percent of the global installed base of 1.74 billion IoT SIMs were managed using commercial connectivity management platforms at the end of 2020. Huawei is the leading IoT CMP vendor in terms of volume with close ties to the domestic operators China Mobile and China Telecom and managed over 900 million IoT SIMs in Q2-2021. Whale Cloud, formerly known as ZTEsoft and partly owned by Alibaba Group since 2018, is the runner-up on the Chinese market.

ZF Bus Connect is a new product which caters to the needs of bus fleet operators. As an advanced fleet management tool, ZF Bus Connect enables public transport or private bus operators to enhance and improve efficiency and performance of their fleets. ZF Bus Connect has also been developed for city buses and coaches with both electric and combustion engines or hybrid systems also in a mixed fleet. The user can check every aspect of the vehicle, including live view of vehicle locations in real-time, observe current energy or fuel consumption, check the status of battery charge or maintain status of the vehicles parts, brake wear and other system messages.

Enterprise Holdings is working with Microsoft to bring connected car technology to Enterprise's car rental, exotic vehicles and commercial truck rental fleets in the U.S., and soon the U.K. and Canada. Enterprise has already implemented this technology for hundreds of thousands of vehicles with more than 350,000 vehicles to be connected by the end of the year.

ORBCOMM Inc. has launched a wireless Tractor ID sensor, which enables trailer pairing confirmation for better driver and operational efficiency. This latest innovation in ORBCOMM's smart truck solution focuses on bringing total tractor to trailer intelligence for improved visibility, efficiency, safety and experience for fleets, drivers and their customers.

Otonomo Technologies, Ltd signed an agreement with Mercedes-Benz Connectivity Services. Otonomo will make available fleet data across 25 countries throughout Europe to fleet management companies and operators, such as delivery companies, service providers, car rental companies and others, so that they can gain instant access to connected vehicle data and improve their productivity and reduce expenses.

The Goodyear Tire & Rubber Company announced a tire intelligence solution for cargo van fleets, Goodyear SightLine. Goodyear SightLine will help enable seamless, safe and reliable mobility for all vehicles starting with cargo vans serving the field service, construction and last-mile delivery industries.

Goodyear Sightline uses sensors along with cloud-based algorithms to communicate with fleet operators in real

time. Goodyear's proprietary predictive maintenance technologies can help to address many challenges facing drivers and fleet managers today, including predicting breakdowns, minimizing downtime and monitoring tire pressure and wear for enhanced safety and more cost-efficient mobility.

Spireon completed a technology platform update and rebranding of its franchise dealer solution from Kahu, to LoJack™. The relaunch significantly expands the LoJack offering, bringing proven IoT management and service retention tools to dealerships, and connected car features to consumers. In addition, LoJack stolen vehicle recovery coverage is utilizing Spireon's strong GPS and cellular networks.

Woven Alpha, Inc., Isuzu Motors Limited, and Hino Motors, Ltd. are utilizing the Automated Mapping Platform (AMP) developed by Woven Alpha. AMP provides high-precision data driven maps by utilizing vehicle fleet data and advanced satellite imagery technology. AMP HD Maps includes multiple layers of data-rich information on road curves and topography, as well as road objects such as lanes, road signs, traffic lights and other objects, providing an accurate representation of the road while keeping it updated.

ALD Automotive partnered with Telefónica Tech and Geotab to develop its connected car solution. ALD Automotive plans to deploy the solution in Europe and Latin America starting with 12 countries in 2021. With this solution, ALD Automotive will be able to remotely manage vehicle fleets in real time, plan car maintenance operations and improve the experience for drivers and fleet managers. This solution helps reduce environmental impact through CO2 emissions tracking and more efficient use of fuel.

ALD Automotive has also signed a preferred partnership agreement with Danlaw to benefit from its DataLogger line of OBD-II devices and Bitbrew cloud platform in support of ALD ProFleet. ALD ProFleet, a newly advanced connected car solution, leveraging Vinli's cloud-connected car and data intelligence platform for smart car data integration and processing, provides fleet managers and drivers access to their real-time connected car data. ALD ProFleet helps facilitate overall fleet management efficiency, optimize fleet utilization, generate savings, improve the driver experience, and contribute to strategic decision making.

General Motors launched Maps+, an in-vehicle, app-based navigation solution, upgrading capabilities for select model year 2018 and newer Chevrolet, Buick, GMC and Cadillac vehicles. Maps+, which is powered by Mapbox, is expected to begin its rollout to approximately 900,000 vehicles on April 30, as part of select Connected Services plans.

Technology
5G/5GNR

While the 5G network for mobile operators is still a work in progress, the pace of deployment and launch is accelerating. By the end of February 2022, according to the GSA (Global mobile Suppliers Association), 489 operators in 146 countries have been investing in 5G networks in the form of tests, pilots, licence acquisitions, planned and actual deployments. Of those, 209 operators in 83 countries have launched commercial 3GPP-compatible 5G services. Furthermore, the GSA said, 99 operators are identified as investing in 5G standalone for public networks.

The number of cities with 5G networks has increased to 1,662 worldwide, according to the VIAVI Solutions report released on June 2021.

The huge demand for faster speeds and greater connectivity among Asian customers is driving the deployment of 5G networks. However, in terms of bandwidth expansion and 5G implementation, China and the United States are well ahead of other countries.

According to IANS (Indo-Asian News Service) report, one in 4 cars will have 5G connectivity by 2025 that will make better use of real-time data transfer and fast cloud-car communication, among other improvements. The research showed that 4G-enabled cars are reaching maturity in developed countries like the US, China, Germany, and the UK, alongside the entrance of 5G telematics control units (TCUs).

Some of the countries with 5G networks are listed below:

China

China overtook the US in connected car shipments in 2021 and will dominate the market until 2025. According to Counterpoint Market Research, due to better network infrastructure and government support, we will see new models enter the market in 2022 from brands including Chevrolet, Geely, Buick, Ford, and BMW. Furthermore, 5G car models such as the Arcfox Alpha T, Roewe Marvel R, and Great Walls 3rd Gen Haval H6, which were launched in 2020, will continue to gain traction. From 2023 onwards, we will see big players like SAIC and BAIC entering the market.

United States

Recently, BMW introduced the first 5G connected cars in the US to feature T-Mobile's Magenta Drive. The all-new 2022 BMW iX and i4 come 5G ready with unlimited 5G data to turn the car into a mobile Wi-Fi hotspot and connect all in-car devices, and unlimited voice calling. In this market, T-Mobile recently launched Magenta Drive for BMW cars and this service, US$20 a month. This service is eSIM-connected to an automotive antenna and uses 600 Mhz and 2.5 Ghz frequencies.

South Korea

According to market research firms, cars connected to 5G networks are expected to account for 25 percent of all cars in 2025. South Korea is lagging behind in 5G convergence, as other mobile carriers are leading the way in the commercialization of automotive 5G and network slicing.

South Korea was the world's first country to roll out commercial 5G networks, in 2019, and currently has the highest proportion of the population using 5G—roughly 36%, compared with 21% in China and 16.5% in the U.S.—according to Omdia, a tech-market research firm. According to internet-speed analysis firm Speedcheck, as of 2021, South Korea also ranked No. 1 in 5G download speeds globally, four times faster than Taiwan and around 10 times faster than the U.S.

The self-driving cars, developed by Seoul-based autonomous-driving startups 42dot and SWM, have a "safety driver" on board who mans the wheel when the cars pull over to pick up and drop off passengers, and in designated children's safety zones, where cars must be hand-steered by law.

The safety driver also can take over in case of an emergency, such as a passenger

falling sick and needing to get to a hospital. Passengers sit in the back seat, where they can track the progress of the car on the road on a virtual map in real time.

In December 2021, Samsung Electronics introduced its automotive chip solutions; the Exynos Auto T5123 for 5G connectivity. The Exynos Auto T5123 is a 3GPP Release 15 telematics control unit specially designed to bring fast and seamless 5G connectivity in both standalone (SA) and non-standalone (NSA) modes to the next generation of connected cars. It delivers essential information to the vehicle in real time through high-speed downloads of up to 5.1 gigabits per second (Gbps) and allows passengers to enjoy a host of new services such as high-definition content streaming and video calls on the go.

Trend

The seamless connectivity of vehicles and enable two-way communication to translate a lot of data and exchange the same over a seamless network. Such vehicles not just gather information of self but also of surroundings, other vehicles, and share it through a single network connectivity. If you connect the data storage level of connected vehicles with Cloud infrastructure, it leads to proper storage and utilization. Using this combination, car drivers will get real insights into the vehicle, geographical locations, consumer usage patterns, and environmental changes.

Chamberlain Group has teamed up with Mercedes-Benz AG to add myQ Connected Garage Control to the Mercedes-Benz MBUX infotainment system. myQ, a dynamic technology platform developed by Chamberlain Group, enables cloud based smart access control solutions including the ability to control garage access from a vehicle's in-dash display or through in-vehicle voice control.

Wejo Limited has unveiled Wejo Studio, a web-based SaaS platform that analyzes data from millions of connected vehicles and translates billions of data points in near real-time into game-changing traffic and journey insights for all business users to leverage. Organizations, from public sector transportation departments to real estate companies to fleet and logistics companies and beyond—can unlock a deeper understanding of mobility trends, enabling them to make smarter decisions

faster, innovate and solve problems more effectively.

Sibros showcased its Deep Connected Platform™ during CES. The platform enables OEMs to deliver new connected vehicle services, reduce costly software recalls and leverage real time vehicle data at scale from one vertically integrated vehicle-to-cloud system.

Data Explosion

While enhanced vehicle connectivity has certainly improved the driving experience, connected cars collect, process and generate vast amounts of data. Some commentators are predicting that autonomous cars will create 4,000 gigabytes (GB) of data per day – which is more than 1,400 terabytes (TB) of data per year.

Iteris, Inc. and Wejo have entered into an agreement to deliver enhanced connected vehicle data content to Iteris' public-sector and commercial customers throughout North America. Under the agreement, Iteris will join Wejo's partner program to provide real-time movement data to new and existing customers from more than 11 million connected vehicles in North America.

Wejo also entered into a strategic partnership with Microsoft to bring the power of connected vehicle data to the commercial sector and enrich Wejo's mobility intelligence portfolio. Under the new agreement, Wejo will build its suite of data and intelligence solutions on the Microsoft Azure cloud platform.

The European Data Protection Board (EDPB) has adopted and published the final version of the Guidelines 01/2020 on the processing of personal data in the context of applications related to connected vehicles and mobility.

These Connected Car Guidelines are addressed to traditional stakeholders in the automotive industry and new players in the digital industry. The guidelines include an additional section with case studies to provide practice-oriented recommendations, such as:

- defining contractual obligation as a legal basis for the data processing of "Pay-as-you-drive" and "Pay-how-you-drive" usage-based insurance services;
- for usage-based insurance services, insurance companies should only receive generated numerical scores, not the raw

data of the car telematics;

- defining a contractual obligation as a legal basis for the data processing of rental-parking services;
- only transmitting data of in-vehicle systems to emergency services and service partners in case of a serious accident, which trigger an emergency eCall to 112 that has been mandatory since 2018;
- only retaining the data obtained in an eCall to 112 until it is needed for the processing of an emergency situation;
- using consent as the legal basis for studies or research for which the data subjects voluntarily provide data;
- using consent as the legal basis for the processing of vehicle location data in the event of a car theft where data subjects wish to find the vehicle.

Market Research

According to the publisher's Global IoT Market Report, Asia Pacific is projected to be the largest global market for IoT in terms of revenue and connections by 2025. For the in-vehicle infotainment market analysis, Asia Pacific includes China, India, Japan, South Korea, and the rest of Asia Pacific. In addition, factors such as growth in GDP, investment in infrastructure, increase in per capita income, increasing inclination towards comfort and ease and government initiatives for FDI have created more opportunities for advanced infotainment services in Asia Pacific.

The most recent report from the Mercator Advisory Group, Autonomous Vehicles, Connected Vehicles, and Their Impact on Payments, finds that autonomous vehicles are a rapidly evolving category that includes pilot programs, small-scale deployments, and implementations in the U.S. and the world.

While much of the AV publicity is related to fully automated self-driving cars moving people in cities, the reality is that the most advanced tests and implementations are happening in the areas of moving packages and food rather than people (zero-occupant) and moving along predefined paths rather than flexible routes.

Walmart has been testing self-driving truck and drone deliveries. Amazon is making deliveries with its autonomous robot, Scout. Uber recently spun out the

Postmates X robotics unit called Serve Robotics, which is making deliveries in Southern California. Autonomous vehicles will have a major impact on the payments ecosystem.

Frost & Sullivan's recent analysis, Global Connected Cars Outlook, 2021, finds that COVID-19 has unlocked massive opportunities for the connected cars industry due to the significant increase in technology implementation in this space. Demand for innovative features such as bio-based health monitoring and non-touch-based haptics such as gesture recognition has increased due to the urgent need for driver protection and risk aversion. In 2021, the global sales of new vehicles with connectivity features are estimated to reach 50 million units after an 8% dip in sales in 2020. This study includes insights on key connected car and auto IoT (Internet of Things) trends, the need for EV services, regional predictions across the United States, Canada, Europe, China, Japan, South Korea, Latin America, and more.

Insurance

Connected cars have data and tracking capabilities that can help insurers in developing accurate pricing strategies based on consumer driving behaviour. The data collected by connected cars can also help insurers in streamlining the claims process and provide cost savings.

LexisNexis® Risk Solutions and Ford Motor Company entered into an agreement so that Ford connected vehicle data can be available to U.S. auto insurers via the LexisNexis® Telematics Exchange. Ford and Lincoln customers with an eligible 2020 model year or newer vehicle can opt in to participate in usage-based insurance (UBI) programs, which has the potential to save customers money through more personalized insurance offerings.

NXP Semiconductors N.V. and MOTER Technologies, Inc. announced a secure data exchange platform that links deep data from connected vehicles to the insurance industry to power data science solutions for risk assessment, cost modeling, and more. The platform combines NXP's S32G2 vehicle network processors, offering a new type of vehicle edge compute with the ability to access vehicle-wide data, with MOTER data analytics software to help

Next_e_GO_Mobile

fully monetize vehicle data for new and improved automotive insurance services.

CVM

Next.e.GO Mobile SE announced the release of its much anticipated e.GO Connect app contemporaneous with celebrating production of the 1000th e.GO Life at Aachen micro-factory. e.GO Connect is available to iOS as well as Android users and can be downloaded from App Store and Google Play. The program has been commenced and vehicles will be connected to the e.GO platform gradually.

MG Motor India offers over 75 plus connected car features under the Car-as-a-platform subscription model. These features will work in conjunction with Map My India, Jio, Park Plus and Shortpedia. The connected features will include the regular suite of geo-fencing, vehicle diagnostics, remote lock/unlock, remote start/stop, and operations via voice commands.

LiveOne announced the launch of LiveXLive on Google's Android Automotive platform. LiveOne's patented technologies and music and podcast services are now available for download in-dash from Google Play as a native Android Automotive application.

Android Automotive is a full-stack, open source, highly customizable software platform powering the vehicle's numerous safety, environmental, and infotainment systems, enabling implementers to differentiate and tailor the content experience specific to a brand's identity. Android Automotive continues to be widely adopted by almost all major automotive OEMs, including Ford, GMC, Dodge, Chrysler, Volvo, Polestar, Ford, Lincoln, Chevrolet, Nissan, Volkswagen, Mitsubishi and others.

Daimler Trucks North America, in collaboration with Platform Science, announced the launch of Virtual Vehicle™, the open OEM platform that enables fleets to access telematics, software solutions, real-time vehicle data, and third-party applications directly from their vehicles. In addition, the platform provides the tools to manage those applications, connectivity, and the mobile devices drivers need to use them. Virtual Vehicle represents a platform-first approach that delivers greater value to customers and offers a vastly expanded choice of software-enabled services.

The Smart Driving Laboratory has introduced an automated system to update and personalize the Connected Car cartographic resources of the Smart Driving Platform. Maps will be updated on a weekly basis, primarily where customers' vehicles are operating keeping in mind their wishes and actions. The new update mode is available for mapping coverage of Russia,

Kazakhstan, Belarus and Brazil. For the operation of the system, a "live" update model has been created, in which data from hundreds of sources on changes in the road network, speed limits, traffic signs, address database and infrastructure objects are linked to the real movements of "connected" transport.

NI has announced its latest product advancements designed to fuel innovation in the production process — from testing and validation to R&D and design. NI and Seagate Technology Holdings announced a new collaboration to enhance data storage services, including a first-of-its-kind advanced driver-assistance systems (ADAS) record offering.

Sirius XM Connected Vehicle Services Inc. launched service in Mexico through NissanConnect® Services powered by SiriusXM. NissanConnect® Services-equipped vehicles come with a six-month trial subscription to SiriusXM Connected Vehicle's Premium service and buyers will have access to features including:
- Automatic Collision Notification
- Emergency Call
- Connection to Roadside Assistance
- Destination Assistance
- My Car Finder
- Nissan Concierge
- Stolen Vehicle Locator
- Remote Engine Start/Stop
- Valet Alert

India

Pricol Limited announced partnership with Sibros Technologies to deliver deep connected vehicle solutions in the domestic and ASEAN markets.

Frost & Sullivan's recent analysis of the Indian Human Machine Interface (HMI) Industry reveals that consumer demand for comfort, safety, and security in their cars contributes to the growth of the Indian HMI market. The growth in demand for advanced connected features in vehicles from the country's growing tech-savvy population will further fuel the development of larger and feature-loaded

Benefits of S-Assist:
○ Provides **multi-media content like DIY (Do-It-Yourself) videos, digital literature and workshop assistance**- all on tap of the smartphone
○ **Easy and quick navigation to digital copy of vehicle owner's manual**, information on warning signs
○ **Picture search**, enables a car owner to take picture of any vehicle part on their smartphone, upload and the app gives instant explanation
○ **Access to over 4,120 Maruti Suzuki workshops across India**, which empowers customers to call and navigate to their nearest Maruti Suzuki workshop at the time of distress

HMI systems. Consequently, the Indian HMI market is projected to grow from $980 million in 2020 to $1.67 billion by 2027.

Sibros announced that Bajaj Auto has deployed its Deep Connected Platform™ to power the company's flagship Chetak electric scooter fleet. Sibros' embedded and cloud products provide Chetak electric scooters with secure OTA software and firmware updates, as well as rich vehicle-to-cloud data insights for all embedded sensors, EV battery analytics and diagnostics. Sibros' API-driven integration has connected its platform to the back-end enterprise and dealer management systems to automate software and data management workflows including its future scalability.

Maruti Suzuki India Limited launched an AI-based 24×7 virtual car assistant app, called "S-Assist" for its NEXA customers. The scan and voice-enabled virtual car assistant, S-Assist, optimizes the application of artificial intelligence and machine learning to provide customers with an immersive online post-purchase experience

MG Motor India has partnered with Jio for internet of things (IoT) solution. The automotive company will provide seamless integration of IT systems enabled by Jio's IoT solution in its upcoming mid-size SUV MG Astor. Customers of MG Astor will benefit from Jio's widespread internet outreach, along with the connectivity, not only in metros but also in small towns and rural areas. Jio's new-age connected vehicle solution is a combination of hardware, software and connectivity that enable users to access trending infotainment and real-time telematics on the go.

Bharti Airtel, India's announced a

collaboration with Intel for 5G network development by leveraging vRAN / O-RAN technologies. The collaboration is part of Airtel's 5G roadmap for India as it transforms its networks to allow its customers to take advantage of the full potential of a hyper-connected world where Industry 4.0 to cloud gaming and virtual / augmented reality become an everyday experience.

India's connected car market is expected to grow by over 20% in the next few years. All luxury and premium car OEMs in India offer connected services across all models, but the services offered by OEMs vary as they produce for the mass market. The availability of connected services in various non-luxury, non-premium OEMs ranges between 20-70% (as a proportion of cars sold where TCU-/dongle-based connected services are an option). Since the Indian market is highly price-conscious, many OEMs offer free connected services for up to three years.

While there exist huge revenue-generating opportunities related to connected services, research shows that customers are still not ready to pay for connected services provided by OEMs. For example, a Capgemini study shows that 44% of customers do not have connected services in their vehicles. And of those who have, only 51% use them.

An analysis of customer feedback from India indicates that price perception and quality of connected services varies among OEMs – the more premium the OEM, the better are the connected services; but the more the mass-market outreach, the poorer is the value and quality perception. ❑

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DEBUNKING "TOP 3 DIGITAL MYTHS" IN INDIAN LOGISTICS

🖋 **JAGMEET SINGH**

Axestrack Software Solutions Private Limited

The epidemic has provided the much-needed catalyst to the maturity of digital in Indian Logistics. From getting information about the availability of oxygen trucks, movement of medicines, tracking of vaccination consignments, a multi-modal movement involving air, rail, and road for emergency pieces of equipment, to online groceries, last-mile deliveries, and other necessities established that digital maturity was not just a hype rather a new disruption to embrace. Globally, as reported by DHL [1], the digital maturity in logistics is far lower than in sectors like media, retail, telecom, insurance, and banking.

The low digital maturity in logistics instigated the need for attention and disruption. So much has been the digital disruption, now, that the lines between the three key elements of Logistics – Man, Material, and Machine (3M) have now started getting blurred & redefined. When all these three key elements work in tandem, the logistics come into life. It is this close-knitted working of 3M which /is being impacted by digital. Though 3M definitions are well defined, however in the context of digital, it is important to re-establish the articulation of the 3M.

Man - includes driver, transporter, fleet owner, logistics personnel both at manufacturing unit/depot/warehouse and corporate office, a policymaker, a non-government stakeholder, and so on. In the digital logistics context, it would mean the persona who is the user of smartphones, understands the digital apps ecosystem, aware of transactions via digital means, and is either the consumer or provider of digital information.

Material – any item or good that is being transported and has a commercial value attached to it. It includes raw material, semi-formed product, final product, a by-product of any other product, and so on. In the digital logistics context, it would mean the digital data logging into a material movement where material's physical, functional, and metadata information is not only available digitally but also can be transmitted and shared via digital methods in real-time and on-demand.

Machine – would be an instrument/method/means required for transporting the material. It includes means like road, rail, air, shipways and in coming future drones and so on. In the digital logistics context, machines would reflect the means and type of vehicle along with their working behavior, availability, tracking, location visibility, performance, downtime, etc. in digital format. Such information should not only be managed digitally but also should enable predictive and preventive aspects to increase the machine's life span and reduce occupational risks and hazards.

The low maturity of digital impacted by sudden demand of digital capabilities due to pandemic needs, caught lots of leaders in Indian logistics by surprise. The scarcity of sufficient knowledge and skills to embrace led to the spread of some myths which have become the centerpiece of every conversation now.

Challenging and debunking those myths is a need of time. It is not only important but also necessary to give digital its rightful place in Indian Logistics.

MYTH 1 – Automated Driver/ Transporter Penalties using digital data would save cost!

Impact Focus - Man

Advice – Digital data only provides the picture, not the whole story!

As per business case understanding, the digital need is for automatic deduction of freight cost and eventually putting cost penalty on the driver/transporter, for a trip, where there has been backward unloading(s) or forward unloading(s). Depending on the type of material being shipped, the penalty may vary. At the outset, it may look like the right thing to do as it would bring transparency and discipline. However, the interpretation of data also matters. One wrong interpretation could result in bad decision-making.

In a country where the driver to truck ratio is 750 per 1000 [2], making an average of 20-30% of trucks lying idle at any given point of time, any level of automation if not done correctly, could do more harm than benefit.

The right way would be to find answers to key questions, like: -
- Is my data (destination, lead data) correct?
- Did the customer change the destination while en-route?
- Was such a change captured by the system?
- Was the route blocked/a new route introduced and there was a detour?
- What is the number of such occurrences over a period?
- Has the device behavior (jump issues, hang, etc.) been considered?
  And so on.

We need to be mindful that it is human who is at the center of getting the job done. So, any decision-making would have a direct impact on the business relationship with the driver/transporter and may increase cost than reduce it.

Case in Point – A leading cement manufacturer wanted to penalize drivers due to a rise in unloading discrepancies. It was initially termed as driver behavior and was speculated to have hand-in-glove arrangements with the receiving party. However, post-analysis and investigation, it turned out to be a new route introduction that had resulted in unloading deviations. This prompted a change in the customer's database for lead distance records. A correction in data resulted in direct freight costs savings and improved relationships with driver/transporters. Instead of automated rules for penalizing, recommendation insights are obtained based on the analytical data using digital platforms, and next-level conversations are then initiated with respective parties.

In Summary - Cost-saving needs long-term thinking and deriving digital benefits would come with experience and maturity.

MYTH 2 – Digital will give 100% visibility into material status and condition all the time!

Impact Focus - Material

Advice - Any claim to deliver 100% visibility of material status and condition has to be substantiated with proof!

Consider this – as per the theft report published in 2020[3,] India accounted for 64% of the cargo theft among all Asian cargo. Top listed commodities stolen were: -

- Food & Beverages
- Electronics
- Alcohol + Tobacco
- Automotives
- Consumer Products
- Construction Materials

Further, material transported by road remained the top category of theft showing an increase to 37 percent in 2019 from 29 percent in 2018. Report categorized location of thefts as: -

- In-Transit – 37%
- Rest Areas – 16%
- Warehouses – 14%
- Unsecured Road Parking – 7%
  And so on.

Adding the data of damaged goods will extrapolate the whole situation to the next level. This raises some questions like –

- Are digital methodologies & tools sufficient to provide visibility into material status & condition?
- Do we need re-look at the stakeholder's relationship responsible for capturing & managing the material status?

The answers to these questions are not simple. There are multiple layers of dependencies and relationships of stakeholders involved to make things work on the ground.

Leveraging digital technology could establish some checks and balances by invoking timely notifications for key parameters like route deviation, long halts, etc., alerting ground teams in case of accidents, mobilizing support and emergency services, and much more. Implementation of monitoring rules can be enabled via digital platforms to achieve near-real-time actions to mitigate unforeseen scenarios.

"

The rightful place of digital is where it provides an immersive experience, not intrusive

Case in Point – A recent story[4] of a leading business establishment in collaboration with a popular e-commerce company was in shock after they realized that they had lost 4,262 boxes valued at 1.35 crores in mere three months. This was despite all standard operating procedures in place. On investigation, it turned out that several people in the logistics chain were involved in the racket.

In Summary - One must accept that once the shipment is out, it is going to be marred by unpredictable scenarios. No two days and scenarios would be the same and the onus is on the stakeholders how they bring agility into monitoring leveraging digital tools and platforms. 100% visibility into material status and condition is a complex relationship to build even with digital and

may not be foolproof.

MYTH 3 – Digital safety methods & tools are required for only specific business segments!

Impact Focus – Man, Material & Machine

Advice – Safety is not a choice but a necessity and is agnostic to the business segment!

In the Indian logistics context, road transportation controls 67% of the freight traffic[2]. Led by trucks and lorries the accidents from road transportation from the commercial vehicle segment make up the third-highest share of deaths at 10% claiming 15,510 lives[2].

As per the Ministry of Road Transportation and Highways (MoRTH)[5] commercial vehicles account for 3rd highest road accidents in India. An accident affects Man, Material, and Machine (3M) directly, barring the degree of impact, as they are interrelated. As per another survey report on drivers [2], the top reasons for crashes have been:-

- Over speeding – 42%
- Fatigue/Sleepiness – 38%
- Drunk driving – 30%
- Negligent/rash driving – 24%
- Overloading of trucks – 8%
- Tire Burst – 9%

And much more. It is important to note that the accident/crash data in reports is agnostic to any business segment. Thus, challenging the myth of safety methods and tools only applicable for specific business segments. Certain segments indeed need more digital safety methods as compared to others however such arguments should not mislead the conversation of safety versus prioritization.

Case in Point – India accounts for 5 lakh road accidents every year, which is the highest across the world and leads to about 1.5 lakh deaths and 3 lakh are seriously injured in these accidents. Unfortunately, 70 percent of deaths occur in the age group of 18 to 45 years[6].

Minister for Road Transport stated "Aiming to address the long-standing issue of driver's fatigue and lack of sleep leading to road accidents on Indian roads, especially highways, called for fixing driving hours of truck drivers. He directed that trucks should be fixed with on-board sleep detection sensors to achieve this purpose"[7].

In Summary - The intent is to ensure the safety of human life, along with assets at stake. While on-board sleep sensors could be one of such first steps, the already available capabilities like voice alerts, speed governors, warning notes and so on should be leveraged irrespective of the business segment the trucker operates it.

There is also an emphasis on the need for extensive integration of AI-based technology, which will remove human interference and the possibility of errors. Some identified high priority areas that could benefit from AI-based technology [6], which are in the discussion are:

- Forensic post-crash investigations,
- The pattern of accidents due to black spots,
- Fatigue indicators,
- Sleep detectors for the driver,
- Advanced vehicle collision avoidance systems.

Safety methods & tools enabled via digital capabilities are now being offered as factory-fitted devices in the new models of vehicles. Indian automotive ecosystem is already gearing up towards digital safety methods and tools. Almost every manufacturer including supplier and solution providers are part of such initiatives. Startups too are equally playing part in this wave of digital safety in India [8]. Such initiatives are the cornerstones of the new era towards commercial trucking in India.

Epilogue – The "Rightful" Place of Digital

In the Indian context, from the three key elements of logistics- Man, Material, and Machine, it is the first one - Man where the digital impact has yet to be ascertained. The other two elements are already showing signs of adoption and a climbing maturity curve. An end-to-end process redesign has to be initiated if we truly want digital to impact logistics. Most of the digital efforts miss out on the opportunity or at times overlook the role of man in the entire journey.

For example – there is no digital footprint or automation to address the driver's plight at the port unloading where they are not allowed to get out of their trailers once they enter the port complex. The bigger the vessel, the longer the wait[9]. This is a classic opportunity to address waste and improve efficiency.

For every logistics initiative where cost is at the center, the goal however should be to reduce such waste and focus on efficiency improvement. Cost as a value lever would get derived from such actions. The right approach should be to invest at the right places in logistics vision like automation, visibility into processes, data-driven decision making, skill development to align with modern technologies, and much more.

Digital is a next-gen technology with possibilities and potentials in Indian logistics yet to be realized. With its nimble nature, agility, and relevance, it would not be fair to challenge or slow down its adoption in the logistics sector.

The case stories are the tip of the iceberg and reflect a glimpse of the current state of myths and affairs. Like with any other technological development, the business case needs to be practical and purposeful. Digital adoption should embrace "human-centric" design principles and business stakeholders should avoid getting into over-promised commitments which may show short-term gain but in the long term impact the brand image of the company and business as a whole.

We get challenged by such myths every day and as part of being responsible partners, we put in the time and effort to educate customers in first defining their digital logistics vision and then helping them to derive benefits. ❑

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INSIGHT: Disruptions to EV battery materials from Russia/Ukraine may extend oil demand

♠ JOSEPH CHANG
Global Editor, ICIS

NEW YORK (ICIS)--The global energy transition will be bumpy to say the least with the Russia/Ukraine war adding additional roadblocks as well as incentives.

Electric vehicles (EVs) are a key facet of the transition, and the disruptions to key minerals supply could slash EV production targets and keep more internal combustion engines (ICE) on the road, thus propping up crude oil demand and prices for longer.

The spike in crude oil prices in the wake of the Russia/Ukraine war is slamming petrochemicals and plastics margins in Europe and Asia in particular, as these producers rely on crude-based naphtha feedstock. If oil prices stay higher for longer, this would exacerbate their structural disadvantage versus US and Middle East producers which predominantly use natural gas liquids (NGLs) feedstock.

A slower EV transition also has implications for chemicals companies developing battery materials as well as specialty polymers and adhesives for EVs.

The big issue is nickel and cobalt, critical components in EV batteries. Russia's Norilsk Nickel (Nornickel) is the world's largest producer of nickel with 236,000 tonnes/year of capacity, according to Elements newsletter.

On 8 March, the London Metal Exchange halted trading in nickel as prices doubled to over $100,000/tonne on Russia supply fears as well as a reported short squeeze.

Cobalt, much of which is produced as a byproduct in nickel refining, may be a bigger issue than nickel itself, according to a chemical company senior executive familiar with the situation.

Most nickel is used in stainless steel, so if there's a major shortage, the material would go to the higher value EV battery side at the expense of lower value stainless steel production, the executive noted.

Basf Supply From Nornickel

BASF is investing heavily in EV battery materials, specifically to boost cathode active materials (CAM) capacity for automotive lithium-ion (Li-on) batteries. These materials include nickel cobalt aluminium oxide (NCA) and nickel cobalt manganese oxide (NCM).

BASF's CAM project in Schwarzheide, Germany broke ground in November 2020 and is slated for start-up in 2022. It would be able to supply around 400,000 EVs/year, according to the company. It would use precursor CAM (PCAM) materials from BASF's plant in Harjavalta, Finland under construction and also scheduled to start up in 2022.

The Harjavalta, Finland facility is being built next to Russia-based Nornickel's nickel and cobalt refinery at the same location, and the companies in 2018 signed a long-term supply agreement for nickel and cobalt feedstocks from the refinery.

A BASF spokesperson told ICIS the company will not pursue new business in Russia and Belarus, except for those related to food production. However, it will still conduct business in Russia and Belarus to fulfil existing commitments.

"This also applies for Nornickel where we do have existing contracts that are fulfilled in line with applicable laws, regulations and international rules. Currently there is no impact on supplies from Nornickel's refinery in Finland," said the spokesperson, who also added that BASF will evaluate these decisions and other matters related to the evolving situation on an ongoing basis.

Ev Penetration Delayed?

If nickel and cobalt supply from Russia is disrupted and prices become prohibitively expensive, this will threaten global automakers' aggressive EV production targets.

US-based Ford is targeting over 2m EVs in 2026, or about a third of its total global production. By 2030, it expects EVs to comprise half of production. US-based GM plans to completely phase out gasoline and diesel vehicles by 2035. Germany-based Volkswagen sees EVs making up half of sales by 2030, and zeroemission vehicles comprising almost the entire fleet by 2040.

Morgan Stanley's auto analyst Adam Jonas said investors should cut their expectations for EV penetration in the coming years based on the nickel price surge, which could add about $1,000 to the cost of producing an EV.

UBS battery analyst Tim Bush raised his nickel/iron battery cost assumptions by 17-24% to reflect price increases, and estimates EV producers would have to raise prices by around 3% to offset inflation.

While nickel prices are rising on fears of Russia supply disruptions, the long-term impact may not be as severe if Russia can continue selling into China.

"Russia accounts for 17% of battery

Global EV production as % of total
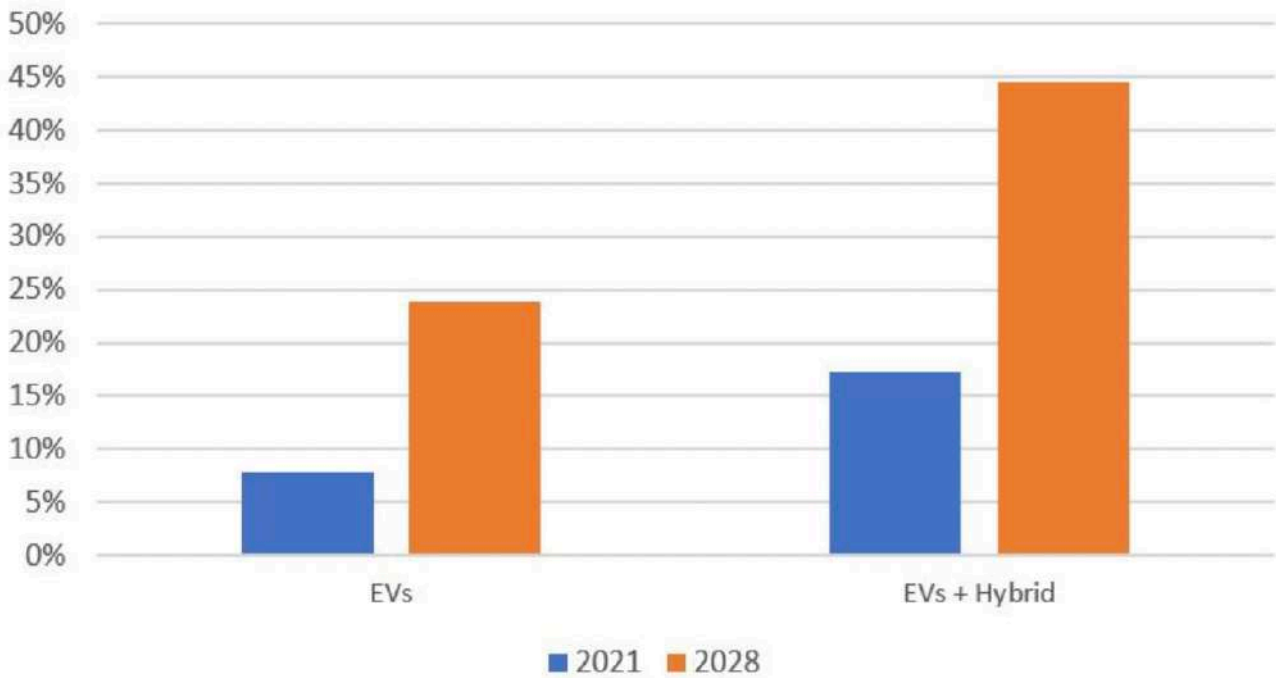
Source: Oxford Economics

grade nickel output and at this stage we do not see issues with China continuing to buy from Russia," said Bush in a research note.

"In the next few years we expect significant growth in battery grade nickel supply from Indonesia and could see rebalancing where China consumes more class 1 nickel from Russia and the West relies more on alternative sources," he added.

Ev Production Forecasts

Global production of EVs is expected to surge from 5.9m units in 2021 to 17.1m in 2025 and 25.5m by 2028, according to Oxford Economics. Hybrid EV production would also rise from 7.1m in 2021 to 19.0m in 2025 and 22.2m in 2028.

By 2028, EVs are expected to comprise 23.8% of total light vehicle production. Together with hybrid EVs, they would account for almost 45% of global light vehicle production, according to Oxford Economics.

That would take a good chunk of oil demand out of the system, as auto transportation fuels drive about half of oil demand.

However, if this EV transition is delayed, a greater number of traditional internal combustion engine (ICE) vehicles on the road would keep transportation demand for oil elevated for longer.

For the automotive market overall, the Russia/Ukraine war stands to cause or exacerbate supply constraints in neon gas for semiconductor production, palladium for catalytic converters, aluminium and steel for auto bodies, and more immediately, wire harnesses which are the cable and wiring that makes all the electrical connections.

"The most imminent problem for the car producers is that the wire harness supply that is needed for European cars is currently on hold in Ukraine, and Ukraine makes up a significant part of European wire harness production," said Patrick Hummel, European auto analyst at UBS, on a 9 March UBS podcast on the Russia/Ukraine impacts across sectors.

However, the good news is that since wire harnessing is a low capital intensity (and high labour intensive) business, supply chains can be reshuffled in several weeks or a couple months with other regions boosting production, he added

"But right now this is the biggest bottleneck for the European industry," said Hummel.

Thus far, major automakers have not sounded the alarm on nickel, aluminium, palladium or other material supplies "but if anything were to happen on these fronts with supply slowing down significantly, we would see a global production impact", the analyst pointed out.

The global automotive market has been undersupplied for the past 18 months, largely on semiconductor constraints. Worldwide car production of 75m units in 2021 was well below normal levels of about 90m, said the UBS analyst.

"So I'm not sure how much additional volume destruction we're going to see from these current levels, even with a more bearish macro outlook," said Hummel.

However, already one automaker is being directly impacted by sanctions.

Russia's Lada, whose parent company AvtoVAZ is owned by France-based Renault Group, has shut down production on lack of parts and supplies because of international sanctions, reported the Wall Street Journal on 9 March.

Additional contribution from Michael Connolly

Insight article by **Joseph Chang**

Safety - The Comprehensive View

The influence of vehicle dynamics on the functional safety of ADAS/AD.

✍ **MICHAEL PEPERHOWE**
dSPACE

The integration of ADAS/AD functions in vehicles serves one goal: To ensure and, where possible, increase the safety of all road users. But what needs to be considered in the validation of intelligent systems? Is the consideration of regulations, test scenarios, sensors, and functions sufficient, or does the dynamic behavior of the vehicle also play a decisive role?

Vehicle Dynamics

A driving dynamics insight: Physically, vehicles are more than a point mass and their dynamic driving behavior has a particular influence on critical driving situations. A simple example might be braking on surfaces with different friction

Figure 1 Full braking at ideal friction value: The truck comes to a stop well before the stationary obstacle (bus). The truck and trailer remain in their own lane.

Figure 2 Full braking with a lower coefficient of friction: A much more critical situation arises, as the lower coefficient of friction lengthens the braking distance and completely changes the movement behavior of the truck-trailer combination. The truck protrudes into the oncoming lane.

coefficients: The vehicle starts skidding as torque is generated around its vertical axis. Even if stability systems intervene to prevent rotation, safety aspects must always be evaluated from a sensor perspective. But what information do these provide when dynamic driving effects influence the imaging sensor technology? And how do functions for ADAS/AD (advanced driver assistance systems/autonomous driving) use this information?

Testing via Simulation

Fortunately, we do not have to perform any elaborate and dangerous maneuvers on the proving grounds to investigate the vehicle's dynamic behavior. With just a few clicks, simulations deliver revealing insights. We want to look at selected relevant situations using the dSPACE tool suite Automotive Simulation Models (ASM) in combination with the sensor-realistic simulation software AURELION.

1) Vehicle Dynamics Testing: Emergency Braking at the Limit

A truck is used to perform emergency braking at the limit on roads with different friction coefficients, for example, due to leaves, wetness, or snow, and with the electronic brake system (EBS) switched off, in order to separately highlight the influence of the vehicle dynamics on the overall system behavior. The braking process is triggered in each case by the automatic emergency braking (AEB) system as part of an ADAS on the basis of the detected collision risk.

The examples show that emergency braking can be realistically represented in the simulation only if all physical aspects of driving are taken into account (friction values, torques between the truck and trailer). And the function of the ADAS can only be fully evaluated and validated
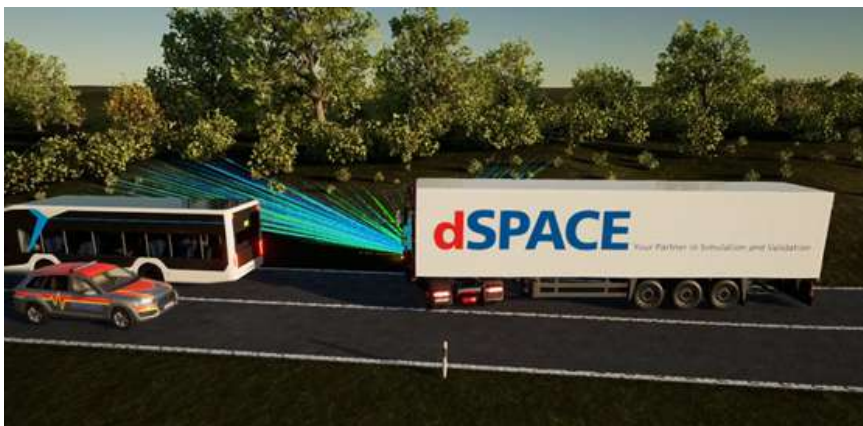
Figure 3 The pitch angle changes the view of the detected obstacle. A strong pitch angle even leads to the obstacle only being partially within the FoV of the sensor, which results in a more difficult object detection (perception).
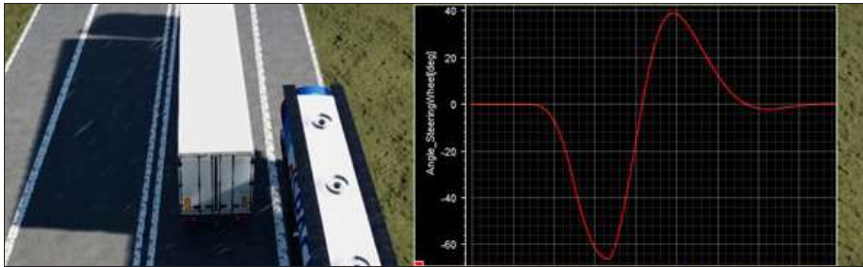

Figure 5 Crosswinds change the direction of travel. Without control measures, the vehicle runs off the road.

Figure 4 Ruts lead to disturbance variables that influence vehicle guidance; the entire vehicle combination may leave the lane.

when the effects of vehicle dynamics are considered. The stability of the overall system must not be disregarded, especially when deciding on emergency braking at the limits of vehicle dynamics.

Taking into Account the Overall Network

In addition, the ASM vehicle models also take into account the behavior of the braking system, both hydraulic and pneumatic, and therefore offer the possibility of testing an ADAS/AD ECU in conjunction with other ECUs, for example, the interaction with an electronic stability controller (ESC). The benefit: The performance of the entire system is included in the evaluation, and the validation is not only provided for a single component, but for an entire system. This provides the ADAS/AD developer with expanded and more sophisticated options for understanding the behavior of the entire system at an early stage and adjusting it if necessary.

2) *Vehicle Dynamics Testing: Pitch Angle of the Driver Cabin During Braking*

When a truck brakes, the accelerations in the direction of travel cause the driver cabin to pitch toward the chassis due to the degree of freedom. The camera sensors installed in the driver cabin therefore change their angle of view. The installed ADAS/AD control units compensate for this change in view so

that the distance to the detected obstacle is calculated correctly.

In order to also include pitch angle compensation in the simulation and to calibrate the ECUs correctly, the pitch angle must correspond to the physical conditions. This is essential for both object detection by individual sensors and downstream sensor fusion. For example, a camera sensor installed in the cabin must achieve the same result in obstacle detection as the radar sensor installed at the bottom of the chassis. Otherwise, there is a risk that the entire system could fail, with potentially serious consequences.

Depending on the driving situation, an originally detected obstacle can disappear partially or even completely from the sensor's field of view (FoV), especially in the case of very strong braking decelerations and a resulting high pitch angle. The behavior of the ADAS/AD functions in these particularly critical situations must be

known and validated.

The following figures show how this behavior can be clearly displayed with ASM Truck and correctly integrated into the simulation with regard to the physical characteristics. The physics-based sensor models in AURELION let you freely configure the sensor position, in particular an installation position of the camera sensor in the cabin with additional degrees of freedom:

3) *Vehicle Dynamics Testing: Ruts in the Road Surface*

One important function of ADAS/AD control units for trucks is active lane keeping assistants (LKA). They must not only detect the road correctly, but also be robust against external disturbances. Such a disturbance can occur, for example, due to the tire-road contact points when the vehicle is in a rut, or lane groove, and has to counter steer.

For reliable validation of the LKA system, it is therefore necessary to be able to realistically represent such disturbance variables in a closed-loop simulation.

With the ASM Road simulation model,

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Michael Peperhowe, Manager of the Automotive Simulation Models (ASM) Vehicle & Environment Group at dSPACE, explains the differences and the benefits and how you can reach a new level of testing realism in a 3D world.

any road surface can be simulated and flexibly parameterized. This gives you very broad test coverage with reproducible tests that you can no longer achieve in real test drives.

4) Vehicle Dynamics Testing: Consideration of Crosswind

Another aspect that is particularly important for trucks is the consideration of crosswinds in automated lane keeping. In connection with wind sheltering, high lateral gusts are generated, which can lead to directional changes and instabilities in vehicles with trailers and semi-trailers. The ADAS/AD control unit must recognize these and respond appropriately.

Again, ASM simulation lets you replicate such situations with high variability. This lets you ensure a high level of maturity of the algorithms at an early stage. Last but not least, these tests are essential for validating the control units.

Evaluation and Overall View

By including the highly accurate vehicle dynamic system behavior, it is possible to simulate the influence of physical effects on ADAS/AD systems and to use them productively for validation. In this way, vehicle dynamics simulation makes an essential contribution to reliable development and validation and ensures robust ADAS/AD ECUs.

In the event of fatal consequences during critical driving situations, the interaction of different effects is often decisive. Precisely these combinations, which often cannot be represented in reality, are made possible by the simulation. The use of realistic traffic and vehicle dynamics simulation is the foundation for an efficient approach to the development of ADAS/AD systems. In addition to development efficiency, both test depth and test breadth increase, which in turn improves the quality of the individual functions and therefore the interaction in the network. ❑

Disclaimer:

All simulations shown were performed with the dSPACE multi-physics tool suite ASM (Automotive Simulation Models). The sensor simulations and animations were calculated and rendered using the high-fidelity 3-D software AURELION.

Renesas unveils R-Car V4H for automated driving Level 2+ / Level 3 to support high-volume vehicle production in 2024

R-Car V4H for Automated Drive L2+ / L3

Renesas Electronics Corporation announced the R-Car V4H system on chip (SoC) for central processing in advanced driver-assistance (ADAS) and automated driving (AD) solutions. The R-Car V4H achieves deep learning performance of up to 34 TOPS (Tera Operations Per Second), enabling high-speed image recognition and processing of surrounding objects by automotive cameras, radar, and lidar.

The R-Car V4H enables performance per watt through a careful combination of best-in-class IP and expert HW optimization. It targets the highest volume zones of automated driving: Level 2+ and Level 3.

The R-Car V4H allows customers to develop cost-competitive, single-chip, ADAS electric control units (ECUs). These control units may support driving systems appropriate for automated driving Levels 2+ and Level 3, including full NCAP 2025 features. The R-Car V4H also supports surround view and automatic parking functions with impressive 3D visualization effects such as realistic rendering.

Combo Solution Supports the Industry's Stringent ASIL Requirements

Regarding ISO 26262 functional safety, the SoC development process targets ASIL D systematic capability for all safety relevant IP. The signal processing portion of the R-Car V4H is expected to achieve ASIL B and D metrics for the real time domain.

Furthermore, Renesas provides a dedicated power solution for R-Car V4H based around the RAA271041 pre-regulator and the RAA271005 PMIC. This enables a highly reliable power supply for the R-Car V4H and peripheral memories from the 12V supply of the vehicle battery. These features enable low power operation while targeting ASIL D compliance for systematic and random hardware faults at very low BOM cost. This helps to minimize the effort of hardware and software development while reducing design complexity, cost, and time to market.

Embedded Software Platform Development Paving the Way to the Software-Defined Car

An R-Car V4H software development kit (SDK) is also available to perform faster and easier initial device evaluation, and software development including deep learning. The SDK offers full functionality for machine learning development, and optimization of embedded systems for performance, power efficiency, and functional safety. Complete simulation models are available, and the Renesas operating system agnostic software platform enables easier development of the software-defined car.

In case of development from scratch, Fixstars' Genesis platform enables engineers to evaluate R-Car from anywhere via their cloud solution and can provide quick and easy CNN benchmark results.

Key Features of R-Car V4H

- Four Arm® Cortex®-A76 at 1.8 Ghz for a total of 49KDMIPS of general compute for ADAS / AD applications
- Three lockstep Arm® Cortex®-R52 cores at 1.4 Ghz, for a total of 9KDMIPS to support ASIL D real-time operation and eliminate the need for external microcontrollers
- Dedicated Deep Learning & Computer Vision I/Ps with overall performance of 34 TOPS
- Image Signal Processor (ISP) with parallel processing for machine and human vision
- Image renderer (IMR) for fisheye distortion correction or other mathematical operation
- Graphic processor Unit (GPU) AXM-8-256 @ 600MHz, for a total of over 150 GFLOPS
- Dedicated automotive Interfaces: CAN, Ethernet AVB, TSN and FlexRay
- Two fourth generation PCIe interfaces

R-Car V4H Vertical Integration

NVIDIA announces Hopper architecture, the next generation of accelerated computing
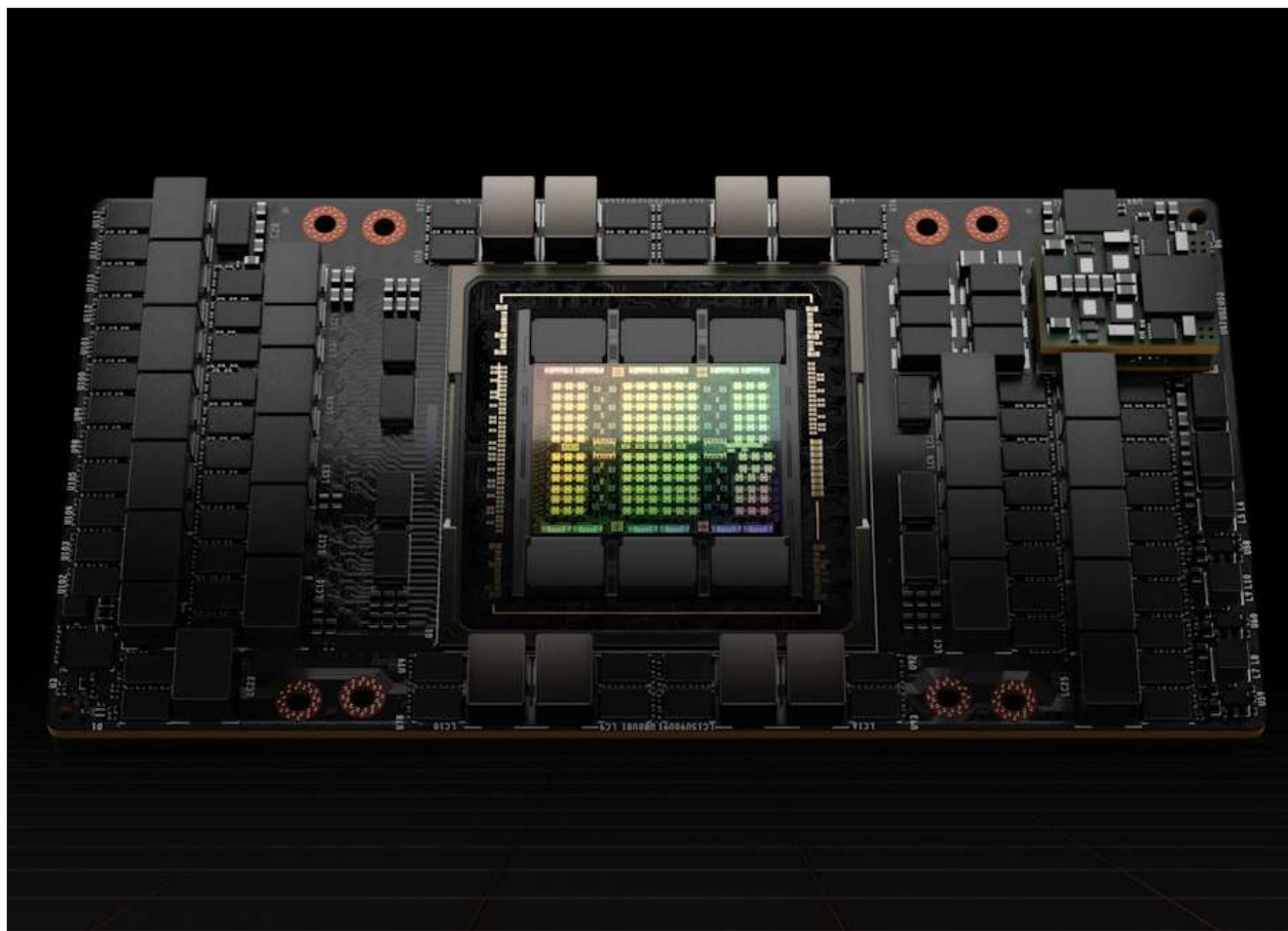
NVIDIA announced its next-generation accelerated computing platform with NVIDIA Hopper™ architecture, delivering an order of magnitude performance leap over its predecessor.

Named for Grace Hopper, a pioneering U.S. computer scientist, the new architecture succeeds the NVIDIA Ampere architecture, launched two years ago.

The company also announced its first Hopper-based GPU, the NVIDIA H100, packed with 80 billion transistors. The world's largest and most powerful accelerator, the H100 has groundbreaking features such as a revolutionary Transformer Engine and a highly scalable NVIDIA NVLink® interconnect for advancing gigantic AI language models, deep recommender systems, genomics and complex digital twins.

H100 Technology Breakthroughs:

The NVIDIA H100 GPU sets a new standard in accelerating large-scale AI and HPC, delivering six breakthrough innovations:

World's Most Advanced Chip - Built with 80 billion transistors using a cutting-edge TSMC 4N process designed for NVIDIA's accelerated compute needs, H100 features major advances to accelerate AI, HPC, memory bandwidth, interconnect and communication, including nearly 5 terabytes per second of external connectivity. H100 is the first GPU to support PCIe Gen5 and the first to utilize HBM3, enabling 3TB/s of memory bandwidth. Twenty H100 GPUs can sustain the equivalent of the entire world's internet traffic, making it possible for customers to deliver advanced recommender systems and large language models running inference on data in real time.

New Transformer Engine — Now the standard model choice for natural language processing, the Transformer is one of the most importat deep learning models ever invented. The H100 accelerator's Transformer Engine is built to speed up these networks as much as 6x versus the previous generation without losing accuracy.

2nd-Generation Secure Multi-Instance GPU — MIG technology allows a single GPU to be partitioned into seven smaller,

fully isolated instances to handle different types of jobs. The Hopper architecture extends MIG capabilities by up to 7x over the previous generation by offering secure multitenant configurations in cloud environments across each GPU instance.

Confidential Computing — H100 is the world's first accelerator with confidential computing capabilities to protect AI models and customer data while they are being processed. Customers can also apply confidential computing to federated learning for privacy-sensitive industries like healthcare and financial services, as well as on shared cloud infrastructures.

4th-Generation NVIDIA NVLink — To accelerate the largest AI models, NVLink combines with a new external NVLink Switch to extend NVLink as a scale-up network beyond the server, connecting up to 256 H100 GPUs at 9x higher bandwidth versus the previous generation using NVIDIA HDR Quantum InfiniBand.

DPX Instructions — New DPX instructions accelerate dynamic programming — used in a broad range of algorithms, including route optimization and genomics — by up to 40x compared with CPUs and up to 7x compared with previous-generation GPUs. This includes the Floyd-Warshall algorithm to find optimal routes for autonomous robot fleets in dynamic warehouse environments, and the Smith-Waterman algorithm used in sequence alignment for DNA and protein classification and folding.

The combined technology innovations of H100 extend NVIDIA's AI inference and training leadership to enable real-time and immersive applications using giant-scale AI models. The H100 will enable chatbots using the powerful monolithic transformer language model, Megatron 530B, with up to 30x higher throughput than the previous generation, while meeting the subsecond latency required for real-time conversational AI. H100 also allows researchers and developers to train massive models such as Mixture of Experts, with 395 billion parameters, up to 9x faster, reducing the training time from weeks to days.

Nvidia's Drive Map, a mapping product for the autonomous vehicle industry

Nvidia has launched a mapping platform geared towards autonomous cars called Drive Map. The map coverage encompasses 482,800 km of roadway across North America, Asia and Europe which will be achieved by 2024.

The platform has a clear intent - it wants autonomy to be ubiquitous and it is a space the world's most valuable semiconductor company has invested heavily in. This technology, Nvidia intends to open up to third parties, just not restrict it to its own platforms.

Alongside this, Nvidia launched the next generation of Drive Hyperion which is its sensor and compute self-driving stack which is used already by the likes of Mercedes, Volvo, JiDU, BYD and Lucid Motors. Autonomous vehicle companies like TuSimple, WeRide, Amazon backed Zoox and DeepRoute.AI are also using Hyperion.

Drive Map is based on the technology from DeepMap, a company Nvidia acquired last year. It enables centimetre level accuracy by combining DeepMap accurate survey mapping data with anonymous mapping data that has been crowdsourced from vehicles that leverage Hyperion platform. The mapping tool kit is a combination of camera, LiDAR, and radar to provide layers of redundancy needed for autonomy.

All the data pulled from Nvidia customers is being uploaded in real time to the Nvidia cloud as the car drives. Then it is aggregated and loaded on Nvidia's omniverse platform which enables virtual collaboration in real time enabling accurate simulations. It is used to update the map so the vehicles can achieve proper localisation. This is how Nvidia scales the map and ensures incredible accuracy.

There are automated Omniverse tools which enable content generation like the building of a detailed map and then is converted into a drivable simulation that be used with the Nvidia Drive Sim.
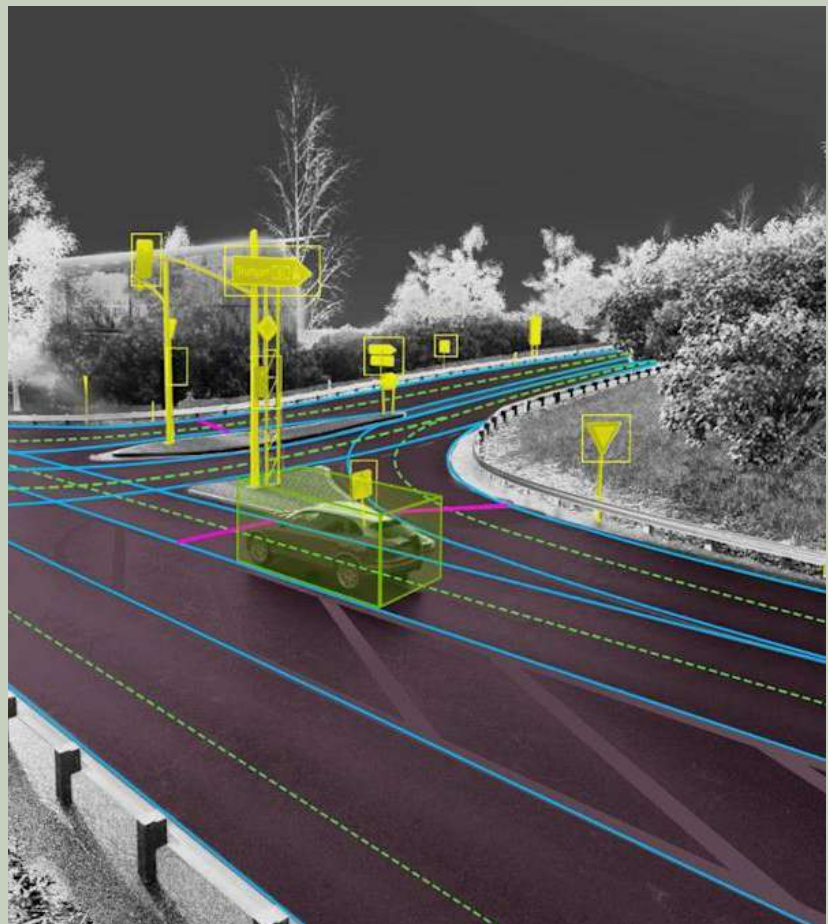
Platform Science and Navistar to bring transformative Virtual Vehicle solution to more trucks

Navistar and Platform Science announced Navistar's integration of Platform Science's Virtual Vehicle™, the open OEM platform that enables fleets to access telematics, software solutions, real-time vehicle data, and third-party applications directly from their vehicles. The collaboration provides International Truck customers with access to a customizable platform that delivers an unlimited canvas to fleets, elevating their capabilities to innovate and utilize, manage and deploy digital applications.

The Virtual Vehicle platform, which Navistar will deploy beginning in 2023, offers many benefits to fleets, including:

- **PRODUCTIVITY:** With factory-installed telematics hardware, fleets can maximize uptime by avoiding installation delays and costs for complementary hardware.
- **FLEXIBILITY:** Virtual Vehicle allows fleets to create a software experience catered to individual business needs through a growing pipeline of developer-created innovations.
- **ACCESSIBILITY:** Virtual Vehicle leverages edge, cloud and in-dash data to optimize networks, keeping data available 24/7/365, even when fleets are offline.
- **COST-EFFECTIVE:** Users of participating applications on Virtual Vehicle benefit from usage-based billing

Bridgestone launches new rigid dump truck tire, real-time tire monitoring solution for construction and quarry customers at AGG1

Bridgestone Americas announced it will showcase the latest in its integrated portfolio of off-the-road (OTR) products, technologies and services at the AGG1 Aggregates Academy & Expo. Demonstrating the benefits of using intelligent products backed by integrated technology solutions, Bridgestone will introduce its new 3-star 24.00R35 rigid dump truck tire and real-time tire monitoring system, IntelliTire, to construction and quarry customers.

Bridgestone is launching a 3-star rigid dump truck tire as an expansion of its 24.00R35 product portfolio, a lineup specially developed for mid-sized rigid dump trucks to carry hefty loads on flat terrain, often at quarries and mines. Featuring a 3-star rating, the new 24.00R35 delivers 8% greater payload capacity along with a deeper tread depth to provide excellent tire wear and improved traction.1 Additionally, the tire provides a high resistance to cuts and heat as trucks transfer larger hauls between long distances at high speeds.

3Dtracking integrates Teltonika ADAS into its Telematics Service Platform

3Dtracking announced the company has integrated Teltonika's Advanced Driver

Assistance Systems (ADAS). The Teltonika ADAS solution and its road safety features are designed to prevent accidents with technologies that alert drivers of potential collisions and other driving mistakes on the road. The Teltonika ADAS camera installed on a vehicle continually monitors for and detects other vehicles, pedestrians, bicycles, motorcycles and lane markings. The driver receives real-time visual and sound alerts through a small monitor installed in front of the driver when potentially dangerous events are detected, including premature or unintentional lane departures, unsafe distance from other vehicles, unsafe proximity to pedestrians or bicycles, and driving over the designated speed limits.
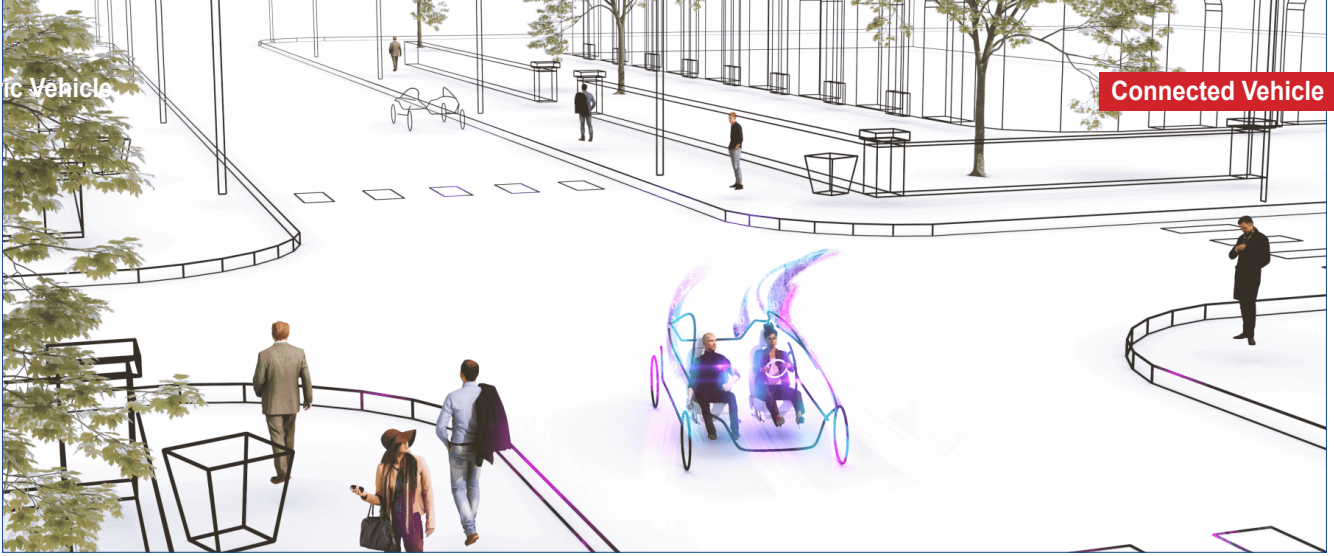
WirelessCar announces AI-research project for sustainable mobility

WirelessCar announced it has signed a two-year project called FREEDOM to conduct research and development on how to turn connected vehicles to sustainable mobility using AI. The project is a collaboration with the Center for Applied Intelligent Systems Research (CAISR) at Halmstad University, represented by Slawomir Nowaczyk, Professor of Machine Learning; and it is partially funded by Vinnova, Sweden's innovation agency within the call Fordonsstrategisk forskning och innovation, Effektiva och uppkopplade transportsystem.

Privacy4Cars secures third patent to delete personal information from vehicles

Privacy4Cars announced that it has secured a new patent for the deletion of data from in-vehicle modules. This marks the third patent for Privacy4Cars, which announced its first two patents for its proprietary processes in November 2021. Privacy4Cars offers a tool to manage and track the deletion of personal information including phone numbers, call logs, text messages, garage door codes, and more that would otherwise remain stored in modern vehicles' systems after a handoff.

U.S. Patent No. 11,256,827 covers additional aspects of the process of managing and aiding data deletion in vehicles by using a computing device. It joins U.S. Patent No. 11,157,648 and U.S. Patent No. 11,113,415 in Privacy4Cars' growing portfolio of data privacy and security in vehicles patents. Privacy4Cars continually invests in innovation and in filing additional US and International patents.

Continental display with private mode entertains passengers and reduces driver distraction

Continental has developed an innovative display that allows vehicle information to be displayed dynamically, either in a private mode or in a way that everyone can see. With the new display technology, the technology company allows front passengers to use multimedia content such as videos or the infotainment system without distracting the driver from road traffic. If necessary, and the traffic situation permits, all vehicle passengers can optionally be given access to this content by means of a switchover. Conventional displays, which up to now have been offered primarily for passengers, do not enable flexible switching to a private mode.

HEADLINES

- Quectel receives Verizon certificate for LTE-A automotive module AG521R-NA
- Volvo Trucks introduces route planning and connected technology tools to support customers in scaling electromobility solutions
- Navistar enables a fully connected future by standardizing factory-installed telematics device on all Class 6-8 vehicles
- Parkopedia expands its parking data services into new industries, starting with Sunny Cars

Gogoro unveils swappable solid-state battery prototype for electric vehicles

Gogoro® Inc. announced the solid-state lithium ceramic battery prototype for two-wheel battery swapping. Jointly developed by Gogoro and ProLogium Technology, the new Gogoro solid state battery prototype integrates with Gogoro's existing vehicles and swapping network.

As the next generation of battery chemistry, solid-state lithium ceramic batteries are expected to replace traditional lithium-ion batteries and become the mainstream power source for electric vehicles and consumer electronics. Solid-state batteries provide higher energy density and deliver a greater range for electric vehicles. Gogoro estimates that its solid-state batteries will increase the capacity of current lithium batteries by 140% or greater, from 1.7 kWh to 2.5 kWh.

Wireless taxi charging in Gothenburg Green City Zone

A test and development project is now underway into wireless charging of electric taxis in service in central Gothenburg. A small fleet of electric taxis will operate for three years using inductive charging. The project is part of the Gothenburg Green City Zone initiative.

Drivers working for taxi operator Cabonline will provide normal taxi services using fully electric Volvo XC40s and wireless charging stations located in specially prepared parking spaces. The first test area will be Lindholmen. The charging technology has been developed by US company Momentum Dynamics and installed on behalf of municipally-owned energy company Göteborg Energi.

The aim is to test and further develop this exciting new charging technology and to gain experience that allows all concerned parties to contribute to the large-scale introduction of zero emission taxis to urban environments.

Amsted Automotive Group brings E-axle Disconnect technology to Rivian Automotive electric vehicles

Amsted Automotive Group developed an E-axle solution that was launched in the new electric vehicle lineup from Rivian Automotive.

The Dynamic Controllable Clutch (DCC), an Electro-Mechanical E-axle Disconnect system, addresses the need for new torque-management solutions for EVs, providing seamless shifting technology and performance, while significantly extending the battery range. Amsted Automotive adapted the technology for Rivian EVs, since traditional clutches are not conducive to the demands of electric propulsion systems.

HEADLINES

- Mercedes-Benz EV ramp-up: new battery plant sets stage for EQS SUV production in the U.S.
- ZETA members ABB and Arrival join Secretary Granholm and Clean Energy leaders from across the U.S. to talk about how Biden's clean energy plan will cut families' costs, create true energy independence
- Hanon Systems expands thermal management production to support growth in electrified vehicles
- Renesas releases next-generation WPC Qi 1.3-Certified reference design for automotive in-cabin wireless charging
- Ford takes bold steps toward all-electric future in Europe; 7 new connected EVs support plans to sell 600K+ EVs annually by 2026
- Mobileware launches onTime Carpool Service to lower transportation costs, improve mobility options and reduce carbon emissions
- Rhythm Energy launches EV Hub, creating a one-stop-shop for consumers to research and power EVs
- Cloud-based and with swarm intelligence: new software generation 3.0 with additional innovative boost for the ID. family

Lucid announces integration of its proprietary DreamDrive Pro advanced driver-assistance system with NVIDIA DRIVE Hyperion software-defined platform

Lucid Group, Inc. announced that its DreamDrive Pro advanced driver-assistance system will add new features in the future, building on NVIDIA DRIVE Hyperion technology – a powerful software-defined platform already integrated in every Lucid Air on the road today.

Lucid's proprietary DreamDrive Pro is designed to grow in capability over time, blending sophisticated hardware – a comprehensive 32-sensor suite, lightning-speed gigabit ethernet networking, and a novel dual-rail power system – and regular over-the-air (OTA) software updates with an in-house software stack built on NVIDIA DRIVE.

DreamDrive Pro has a rich 32-sensor suite consisting of 14 cameras, 1 lidar, 5 radar, and 12 ultrasonic units. Lucid's innovative dual-rail power system and proprietary Ethernet Ring offer an especially high degree of redundancy for key systems, such as braking, steering, and sensors. Lucid's DreamDrive Pro ADAS, announced last year, is standard in Lucid Air Dream Edition and Lucid Air Grand Touring and is optional in other Lucid Air models.

Ford now operates 3D printers autonomously, increasing efficiency and reducing cost

Ford Motor Company introduced a new 3D printing workflow where it is using autonomous robots for operating 3D printers. The innovative robot on wheels from supplier KUKA is named Javier and is being used at Ford's Advanced Manufacturing Center in Redford, Michigan.

The autonomous robots for operating 3D printers is integral to the company's development of an industry-first process to operate Carbon 3D printers which can move from one place to the other in the process.

Ford has a high level of accuracy with Javier, reducing margins of error by using his feedback. In addition to 3D printers, the method can be used to improve efficiency and lower costs by applying it to a wide range of robots already in use at the company. Ford has filed several patents related to the overall process, communication interfaces, and precise robot positioning that do not require the use of a camera vision system to "see."

Ford created an application interface programme that enables various pieces of equipment to "speak the same language" and provide continuous feedback to one another. The Carbon 3D printer, for example, notifies the KUKA autonomous mobile robot when the printed product is complete, and the robot then notifies the printer that the robot has arrived and is ready for pickup. The entire process is made possible by this innovative communication.

HEADLINES

- Kia America and Currently mobile charging service announce partnership to "Recharge" electric vehicle ownership
- Volkswagen and Ford expand collaboration on MEB electric platform
- Cintra and Assembly Intelligence partner to focus on smart transportation infrastructure
- Nexteer Automotive & Tactile Mobility announce advanced road & tire detection software
- BMW Group, Qualcomm and Arriver™ to form long-lasting strategic cooperation for joint development of automated driving software solutions
- Pony.ai announces first close of Series D financing round, with a valuation of $8.5 Billion
- Geotab and Free2move partner to deliver an integrated telematics solution for Stellantis
- Joint EMITE and Anritsu solution adds 6 GHz band to test latest Wi-Fi 6E devices
- Haldex signs agreement with KRONE for the supply of EB+4.0
- PG&E and General Motors collaborate on pilot to reimagine use of electric vehicles as backup power sources for customers
- Innoviz selects BlackBerry QNX Operating System for its InnovizOne and InnovizTwo LiDAR sensors
- VinFast US and Urgently to create white glove roadside assistance program for EVs
- Hyundai Motor and Iveco Group sign MOU to explore future collaboration
- Electreon aligns with Jacobs to grow U.S. wireless EV charging infrastructure
- Qualcomm selects Cubic Telecom as its connected software partner
- Britishvolt and Aston Martin partner to develop high-performance battery technology
- Renesas Automotive Semiconductors selected by Honda for ADAS
- Daimler Truck North America selects MOTOR for heavy-duty integrated data
- Uniphy Limited and Hyundai Motor Group to collaborate on next-generation smart Human Machine Interfaces (HMIs) for Automotive
- Argus Cyber Security joins NXP® S32G GoldVIP Vehicle Integration Platform
- Qmerit partners with Fermata Energy to accelerate Vehicle-to-Everything (V2X) solutions for commercial, multi-family and utility customers
- SGESCO-MAX teams up with MiX Telematics in Australia
- OCTO Telematics and Ford Motor Company partner for accurate data management of connected cars in Europe
- Otonomo to acquire The Floow, a leader in connected insurance technology
- Parkopedia and APCOA PARKING Group partner to enable digital parking services of the future
- ENEOS, Toyota, and Woven Planet collaborate to facilitate CO2-free hydrogen production and usage for Woven City and beyond
- Volkswagen Group and SEAT reveal electrification plan for Spain
- Foretellix and NVIDIA deliver end-to-end solution for ADAS/AV Development, verification, and validation
- Stellantis and LG Energy Solution to invest over $5 Billion CAD in joint venture for first large-scale lithium-ion battery production plant in Canada
- PreAct Technologies and ESPROS Photonics collaborate on next-generation sensing solutions
- U Power collaborates with NVIDIA on open vehicle computing platform that scales from Level 2 to Level 4 autonomous driving
- Toyota and ChargePoint enhance EV driving experience with home and public charging
- BlackBerry and Marelli expand collaboration in China region to power next generation cockpit technology
- GM announces additional investment in Cruise

Sony and Honda sign MoU for strategic alliance in mobility field

Sony Group Corporation and Honda Motor Co., Ltd. announced that they have agreed to deepen discussion and exploration of forming a strategic alliance that aims to create a new era of mobility and mobility services. Specifically, the two companies have signed a memorandum of understanding that outlines their intent to establish a joint venture through which they plan to engage in the joint development and sales of high value-added battery electric vehicles (EVs) and commercialize them in conjunction with providing mobility services.

The two companies will proceed with negotiations toward executing various definitive binding agreements, including a joint development agreement and a joint venture agreement, with a goal of establishing the New Company within 2022, subject to execution of the definitive agreements and relevant regulatory approvals.

Bridgestone invests in autonomous driving technology provider May Mobility

Bridgestone Americas announced a minority investment in May Mobility, marking the company's first investment in public-serving autonomous vehicles. The new partnership will include the future integration of Bridgestone's digital and predictive tire-centric technologies into May Mobility autonomous vehicles, granting deeper AV intelligence for even safer and more efficient operation. Through the partnership, Bridgestone will also gain valuable insights into autonomous vehicle operations to improve its core tire products and mobility solutions.

The new relationship between Bridgestone and Ann Arbor, Michigan-based May Mobility expands the AV technology company's ability to operate and service its vehicles in new markets through Bridgestone's nationwide network of more than 2,200 tire and automotive service centers doing business under the Firestone Complete Auto Care, Tires Plus, Hibdon Tires Plus and Wheel Works retail brands.

Hyundai Motor accelerates electrification strategy, targeting 7% of global EV market by 2030

Hyundai Motor Company unveiled a strategic roadmap to accelerate its electrification ambition as it pursues sustainable progress for the company.

The roadmap for Hyundai's battery electric vehicle (BEV) is supported by: strengthening BEV line-ups, optimizing manufacturing capacity, and securing hardware and software competitiveness. Under the plan, the company aims to boost annual global BEV sales to 1.87 million units and secure a 7 percent level of global market share by 2030.

Hyundai presented its mid-to long-term financial goals. The company earmarked KRW 95.5 trillion of investment for future businesses by 2030, including KRW 19.4 trillion for electrification and KRW 12 trillion for software capabilities.

By 2030, Hyundai targets to achieve an operating profit margin of 10 percent or higher in EV businesses by enhancing competitiveness in hardware and software capabilities with an expanded line-up. On a consolidated basis, it aims to secure an operating profit margin of 10 percent.

Zero Roadway Deaths Means Seeing Everything Sooner, Clearer and Farther with Breakthrough Technology

Neural Propulsion Systems (NPS) issued a paper revealing that compelling new innovations enable vehicles with or without human supervision to see soon enough, clear enough and far enough to eliminate roadway deaths.

The paper finds that zero deaths require sensing and processing a peak data rate on the order of 100 X 1012 bits per second (100 Terabits per second) for vehicles to safely operate under worst roadway conditions. This immense requirement is 10 million times greater than the sensory data rate from our eyes to our brains.

NPS achieved pilot scale proof-of-concept of the core sensor element required for zero roadway deaths at a Northern California airfield in December 2021. One reason for this successful historic event is the Atomic Norm, a recently discovered mathematical framework that radically changes how sensor data is processed and understood. Atomic Norm was developed at Caltech and MIT and further developed specifically for autonomous driving by NPS.

Electric vehicles are delivering marked cost savings for drivers, and surging gasoline prices are making the cost-savings increasingly apparent

The Zero Emission Transportation Association's (ZETA) new analysis shows that EVs are saving—and will continue to save—consumers money on operating costs. The three gas-powered vehicles featured in the data set represent some of the most popular vehicles in the SUV, pickup, and sedan categories. For each of these vehicles and in all of the states that ZETA analyzed, these vehicles' EV analogues are far cheaper to drive per mile.

Some key facts from the report:

◆ Overall, as of March 2022, driving an EV is dramatically cheaper per mile than driving a gas-powered vehicle. Nationally, EVs are 3-5 times cheaper to drive per mile than gas-powered vehicles. In Arizona, Florida, Georgia, Nevada, North Carolina, Tennessee, and Virginia, some EVs are 5–6 times cheaper to drive.

◆ The sticker price for EVs are nearing parity with gas-powered vehicles, according to the International Council on Clean Transportation.

◆ The lifetime cost of ownership for EVs is thousands of dollars cheaper than gas-powered vehicles, saving EV owners anywhere between $6,000 and $10,000 over the lifespan of the car, according to Consumer Reports.

HEADLINES

- Worldwide automotive aftermarket telematics industry to 2026 – Rising in-vehicle communication options is driving growth

- 2022 Growth Opportunities for Personal Protective Equipment in Global Electric Vehicles

- Global In-vehicle Infotainment Market (2021 to 2027) – Government mandates on telematics and e-call services presents opportunities

- Private LTE/5G network deployments to tenfold in the next five years

Tata Motors is developing hydrogen fuel cell technology in India

With industries and sectors across the country now making strides to deploy hydrogen as a source of energy in the automobile sector, Tata Motors has taken significant steps & has been leading in the development of Hydrogen-powered vehicles:

◆ Tata Motors had been working on a fuel cell technology demonstrator vehicle project, conceptualized in association with the Government of India as part of the Technology Development and Demonstration Program (TDDP). Collaborated with the Indian Space Research Organization (ISRO) during its development for system integration, testing, and certification.

◆ A dedicated lab for this technology has been instituted by Tata Motors in Pune. Prior to this, the lab was in Bengaluru where the company collaborated with ISRO and the Indian Institute of Science (IISC) to work on the technology.

◆ Tata Motors has also developed its hydrogen handling and onboard storage capability, along with the associated safety system.

◆ It has built a dedicated hydrogen dispensing station and test track at Sanand to test fuel cell buses.

Mobility startup Chalo acquires two-wheeler rental platform Vogo

Chalo has acquired Bengaluru-based two-wheeler rental platform Vogo in a share-swap deal. It's a 100% buyout of Vogo. However, both the parties did not disclose the deal value.

According to Vogo, it would continue to be known under the same brand name and maintain its own app after the acquisition. As per a press statement, this acquisition offers Chalo some of the key strategic gains. Vogo will now augment Chalo's bus technology services by powering first and last-mile rides at major bus stops and other public places.

As a part of this acquisition, the two-wheeler rental platform will now switch to electric vehicles across its fleet. Vogo is also set to expand beyond two-wheelers and will offer other types of EVs to suit market needs.

Suzuki announces $1.37B electric vehicle manufacturing investment

Suzuki Motor is planning to invest $1.37 billion in its India factory to produce all-electric vehicles and batteries, its India unit.

Maruti Suzuki India said it is transitioning one of its factories in the country to produce electric vehicles in a bid to align with the national strategy to reduce oil independence and restrict air pollution in major cities.

Japanese Prime Minister Fumio Kishida said the country would invest $42 billion in India over the next five years. Kishida met with Indian Prime Minister Narendra Modi, whose Make in India campaign has encouraged companies to favor manufacturing in the country.

HEADLINES

● Skill-Lync and Renault Nissan Technology & Business Centre India announce a strategic partnership to drive comprehensive talent transformation programs

● Hero MotoCorp launches brand 'Vida' for its electric mobility

● MG Motor announces new venture MG Charge to build EV charging infrastructure

● Cost of electric vehicles to be at par with petrol vehicles in 2 years: Nitin Gadkari

● Oye! Rickshaw targets 15-20 Mn deliveries by 2022; set to disrupt India's last-mile delivery ecosystem for e-commerce players

● Faster 5G roll-out: Trai runs a pilot to use traffic signals, light poles for telecom infrastructure

● Continental India reaches a production milestone of five million Electronic Brake System units

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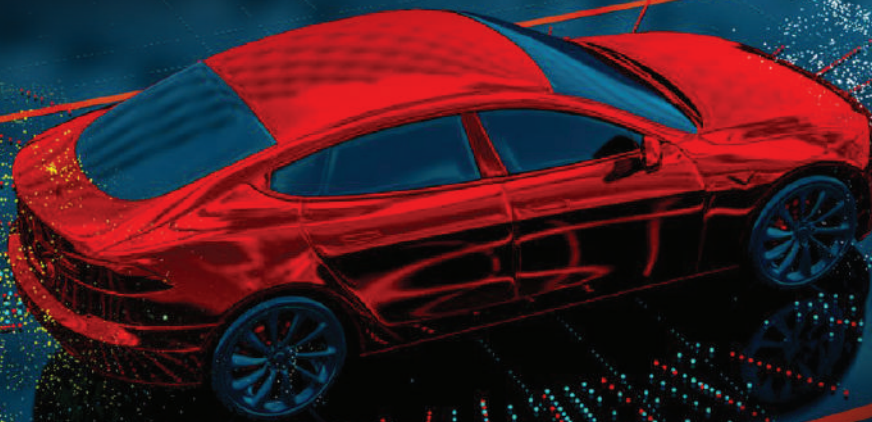
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- Automakers
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- Chip Manufacturers
- Semiconductors

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- Software/Hardware Providers
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- Lighting Companies
- Map Providers
- Content Providers
- Application Developers
- Big Data Analytics

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- Cloud Service Providers
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- Electric Vehicle Manufacturers
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- State Transport Corporations
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- Academia/Institutions

- Car Sharing Companies
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- PSU / STC
- Financial Services
- Associations
- Consultants
- Investors
- Logistics & Transport

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